

SILABUS INFORMATIKA (S1)

Program Studi	Informatika
Jenjang Pendidikan	Sarjana (S1)

Capaian Pembelajaran Lulusan		
Sikap	1.1	Bertakwa kepada Tuhan Yang Maha Esa dan mampu menunjukkan sikap religius
	1.2	Menjunjung tinggi nilai kemanusiaan dalam menjalankan tugas berdasarkan agama, moral, dan etika
	1.3	Berkontribusi dalam peningkatan mutu kehidupan bermasyarakat, berbangsa, bernegara, dan kemajuan peradaban berdasarkan Pancasila
	1.4	Berperan sebagai warga negara yang bangga dan cinta tanah air, memiliki nasionalisme serta rasa tanggungjawab pada negara dan bangsa
	1.5	Menghargai keanekaragaman budaya, pandangan, agama, dan kepercayaan, serta pendapat atau temuan orisinal orang lain
	1.6	Bekerja sama dan memiliki kepekaan sosial serta kepedulian terhadap masyarakat dan lingkungan
	1.7	Taat hukum dan disiplin dalam kehidupan bermasyarakat dan bernegara
	1.8	Menginternalisasi nilai, norma, dan etika akademik
	1.9	Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri
	1.10	Menginternalisasi semangat kemandirian, kejuangan, dan kewirausahaan
	1.11	Berusaha secara maksimal untuk mencapai hasil yang sempurna
	1.12	Bekerja sama untuk dapat memanfaatkan semaksimal mungkin potensi yang dimiliki
Keterampilan Umum	1.1	Mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam konteks pengembangan atau implementasi ilmu pengetahuan dan teknologi yang memperhatikan dan menerapkan nilai humaniora yang sesuai dengan bidang keahliannya

Capaian Pembelajaran Lulusan		
	1.2	Mampu menunjukkan kinerja mandiri, bermutu, dan terukur
	1.3	Mampu mengkaji implikasi pengembangan atau implementasi ilmu pengetahuan teknologi yang memperhatikan dan menerapkan nilai humaniora sesuai dengan keahliannya berdasarkan kaidah, tata cara dan etika ilmiah dalam rangka menghasilkan solusi, gagasan, desain atau kritik seni
	1.4	Menyusun deskripsi saintifik hasil kajian tersebut di atas dalam bentuk skripsi atau laporan tugas akhir, dan mengunggahnya dalam laman perguruan tinggi
	1.5	Mampu mengambil keputusan secara tepat dalam konteks penyelesaian masalah di bidang keahliannya, berdasarkan hasil analisis informasi dan data
	1.6	Mampu memelihara dan mengembangkan jaringan kerja dengan pembimbing, kolega, sejawat baik di dalam maupun di luar lembaganya
	1.7	Mampu bertanggungjawab atas pencapaian hasil kerja kelompok dan melakukan supervisi dan evaluasi terhadap penyelesaian pekerjaan yang ditugaskan kepada pekerja yang berada di bawah tanggungjawabnya
	1.8	Mampu melakukan proses evaluasi diri terhadap kelompok kerja yang berada dibawah tanggung jawabnya, dan mampu mengelola pembelajaran secara mandiri
	1.9	Mampu mendokumentasikan, menyimpan, mengamankan, dan menemukan kembali data untuk menjamin kesahihan dan mencegah plagiasi
	1.10	Mampu mengembangkan diri dan bersaing di tingkat nasional maupun internasional
	1.11	Mampu mengimplementasikan prinsip keberlanjutan (sustainability) dalam mengembangkan pengetahuan
	1.12	Mampu mengimplementasikan teknologi informasi dan komunikasi dalam konteks pelaksanaan pekerjaannya
	1.13	Mampu menerapkan kewirausahaan dan memahami kewirausahaan berbasis teknologi
Pengetahuan	1.1	Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik

Capaian Pembelajaran Lulusan

		pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik
	1.2	Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika
	1.3	Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan
	1.4	Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum
	1.5	Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer
	1.6	Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi
	1.7	Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format

Capaian Pembelajaran Lulusan		
	1.8	Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman
Keterampilan Khusus	1.1	Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang
	1.2	Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien
	1.3	Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang
	1.4	Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial
	1.5	Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai
	1.6	Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien
	1.7	Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien
	1.8	Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa

Capaian Pembelajaran Lulusan		
		pemrograman untuk menghasilkan aplikasi yang sesuai

**DAFTAR MATA KULIAH
PROGRAM SARJANA**

No	Kode MK	Nama Mata Kuliah (MK)	SKS
SEMESTER: 1			
1	UG184911	Pancasila	2
2	UG184912	Bahasa Indonesia	2
3	KM184101	Matematika 1	3
4	SF184101	Fisika 1	4
5	SK184101	Kimia	3
6	IF184101	Dasar Pemrograman	4
		Jumlah SKS	18
SEMESTER: 2			
1	UG184914	Inggris	2
2	UG18490X	Agama	2
3	UG184913	Kewarganegaraan	2
4	KM184201	Matematika 2	3
5	SF184202	Fisika 2	3
6	IF184201	Sistem Digital	3
7	IF184202	Struktur Data	3
		Jumlah SKS	18
SEMESTER: 3			
1	IF184301	Pemrograman Berorientasi Objek	3
2	IF184302	Aljabar Linier	3
3	IF184303	Komputasi Numerik	3
4	IF184304	Matematika Diskrit	3
5	IF184305	Organisasi Komputer	3
6	IW184301	Sistem Basis Data	4
		Jumlah SKS	19
SEMESTER: 4			
1	IF184401	Perancangan dan Analisis Algoritma	4
2	IF184402	Sistem Operasi	4
3	IF184403	Kecerdasan Buatan	3
4	IF184404	Manajemen Basis Data	3
5	IF184405	Probabilitas dan Statistik	3
6	IF184406	Analisis dan Perancangan Sistem Informasi	3
		Jumlah SKS	20

No	Kode MK	Nama Mata Kuliah (MK)	SKS
SEMESTER: 5			
1	IF184501	Perancangan Perangkat Lunak	3
2	IF184502	Grafika Komputer	3
3	IF184503	Kecerdasan Komputasional	3
4	IF184504	Pemrograman Web	3
5	IF184505	Jaringan Komputer	4
6	IF184506	Manajemen Proyek Perangkat Lunak	3
		Jumlah SKS	19
SEMESTER: 6			
1	IF184601	Interaksi Manusia dan Komputer	3
2	IF184602	Pemrograman Jaringan	3
3	IF184603	Rekayasa Kebutuhan	3
4	IF184604	Teori Graf dan Otomata	3
5	IF184605	Pemrograman Berbasis Kerangka Kerja	3
6		Pilihan 1	3
		Jumlah SKS	18
SEMESTER: 7			
1	UG184915	Technopreneur	2
2	IF184701	Keamanan Informasi dan Jaringan	3
3	IF184702	Pra-Tugas Akhir	3
4		Pilihan 2	3
5		Pilihan 3	3
6		Pilihan 4	3
		Jumlah SKS	17
SEMESTER: 8			
1	IF184801	Kerja Praktik	2
2	IF184802	Tugas Akhir	4
3	UG184916	Wawasan dan Aplikasi Tekonlogi	3
4		Mata Kuliah Pengayaan	3
5		Pilihan 5	3
		Jumlah SKS	15

DAFTAR MATA KULIAH PILIHAN

No	Kode MK	Nama Mata Kuliah (MK)	SKS
1	IF184901	Pemrograman Perangkat Bergerak	3
2	IF184902	Pengembangan Analisis Algoritma	3
3	IF184903	Pemrograman Berbasis Antarmuka	3
4	IF184911	Jaringan Nirkabel	3
5	IF184912	Teknologi antar Jaringan	3
6	IF184913	Perancangan Keamanan Sistem dan Jaringan	3
7	IF184914	Teknologi IoT	3
8	IF184921	Pemodelan dan Simulasi	3
9	IF184922	Analisis Data Multivariat	3
10	IF184923	Riset Operasi	3
11	IF184931	Teknik Pengembangan Game	3
12	IF184932	Realitas Virtual dan Augmentasi	3
13	IF184933	Sistem Game	3
14	IF184934	Animasi Komputer dan Pemodelan 3D	3
15	IF184935	Game Cerdas	3
16	IF184941	Jaringan Multimedia	3
17	IF184942	Komputasi Awan	3
18	IF184943	Komputasi Bergerak	3
19	IF184944	Sistem Terdistribusi	3
20	IF184945	Forensik Digital	3
21	IF184946	Komputasi Grid dan Paralel	3
22	IF184947	Komputasi Pervasif dan Jaringan Sensor	3
23	IF184948	Kompresi Data	3
24	IF184951	Data Mining	3
25	IF184952	Pengolahan Citra Digital	3
26	IF184953	Komputasi Biomedik	3
27	IF184954	Robotika	3
28	IF184955	Sistem Temu Kembali Informasi	3
29	IF184956	Visi Komputer	3
30	IF184957	Analisis Jejaring Sosial	3
31	IF184958	Deep Learning	3
32	IF184961	Sistem Enterprise	3
33	IF184962	Rekayasa Pengetahuan	3
34	IF184963	Audit Sistem	3
35	IF184964	Tata Kelola Teknologi Informasi	3
36	IF184965	Basis Data Terdistribusi	3

No	Kode MK	Nama Mata Kuliah (MK)	SKS
37	IF184966	Big Data	3
38	IF184967	Sistem Informasi Geografis	3
39	IF184971	Arsitektur Perangkat Lunak	3
40	IF184972	Penjaminan Mutu Perangkat Lunak	3
41	IF184973	Evolusi Perangkat Lunak	3
42	IF184974	Konstruksi Perangkat Lunak	3
43	IF184981	Topik Khusus	3
44	IF184982*	Pengantar Logika dan Pemrograman	3
45	IF184983*	Pengantar Teknologi Basis Data	3
46	IF184984*	Pengantar Proses Mining	3
47	IF184985*	Pengantar Pengembangan Game	3
48	IF184986*	Pengantar Sistem Cerdas	3

MATA KULIAH	Nama MK	: Dasar Pemrograman
	Kode MK	: IF184941
	Kredit	: 4 SKS
	Semester	: 1

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa akan belajar mengenai konsep dasar-dasar pemrograman dan mempraktekkannya. Perkuliahan dilakukan di kelas dan praktik dilakukan di kelas maupun di laboratorium. Mahasiswa akan belajar tentang algoritma sederhana, cara menuangkan algoritma, konsep percabangan, konsep perulangan, input, proses dan output, merumuskan solusi algoritma untuk permasalahan iterative dan percabangan bertingkat, menelusuri dan mensimulasi eksekusi fungsi rekursif dan mengimplementasikan algoritma sesuai rumusan solusi dalam bentuk program dengan bahasa pemrograman tertentu.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami metodologi pengembangan software (analisa, design, coding, testing, dokumentasi) dan mampu menerapkan metodologi tersebut pada persoalan-persoalan sederhana.
- Mahasiswa mampu merancang program secara modular/terstruktur dengan pendekatan top-down menggunakan fungsi-fungsi.
- Mahasiswa mampu mengimplementasikan algoritma dengan benar dan terstruktur menggunakan bahasa C.
- Mahasiswa mampu melakukan proses debugging dan pengujian.
- Mahasiswa mampu berpikir komprehensif dalam merancang dan mengimplementasi program.
- Mahasiswa mampu berkomunikasi dan bekerja sama dalam sebuah tim melalui mekanisme dokumentasi program.
- Mahasiswa mampu menuangkan hasil pemikirannya dalam bahasa lisan maupun tulisan dengan baik.

POKOK BAHASAN

Konsep Pemrograman, definisi dan contoh algoritma, flowchart, Pemrograman dengan implementasi decision (tanpa iterasi): ekspresi, control flow, input & output; Variabel, assignment, perilaku dinamis variabel, debugging; Control flow dengan label (goto), Control flow dengan statement loop (while, for, break, continue), Tipe-tipe data primitif, sifat dan batas-batasnya, Konversi tipe, Array satu dimensi, String sebagai array char, Fungsi-fungsi input / output, Format; Operasi aritmetik, logika, bitwise, Hirarki operator, Konversi implisit dan casting, Permasalahan akurasi; Sorting: Bubble, Selection, linear search, konsep memory, tipe data pointer, aritmetika pointer, operator sizeof, alokasi memori dinamis; fungsi, parameter, return: tipe & perilakunya, rekursif; array multidimensi dengan definisi statis dan alokasi dinamis; routing pada labirin, tic-tac toe, operasi string, implementasi graph pada matriks 2 D, algoritma djikstra, Struct dan union, konsep file, fungsi-fungsi manipulasi, membuat aplikasi katalog, device grafik, fungsi-fungsi manipulasi grafik 2D, membuat gambar dengan komposisi bentuk-bentuk geometris dasar, membuat kurva dengan fungsi matematis, membuat kurva dengan fungsi parameter, membuat game atau editor.

PRASYARAT

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PUSTAKA

- Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.

MATA KULIAH	Nama MK	: Sistem Digital
	Kode MK	: F184201
	Kredit	: 3 SKS
	Semester	: 2

DESKRIPSI MATA KULIAH

Mata kuliah ini menjelaskan berbagai macam sistem bilangan, menentukan fungsi Boolean dari suatu sistem digital dan melakukan penyederhanaan menggunakan beberapa metode.

Mata kuliah ini juga menjelaskan fungsi dan karakteristik berbagai komponen sistem digital dan menjelaskan proses analisis dan perancangansistem digital baik berupa rangkaian kombinasional maupun sekuensial.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;

Keterampilan Khusus:

Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menganalisis & melakukan perancangansistem digital baik berupa rangkaian kombinasional maupun sekuensial.

POKOK BAHASAN

- **Sistem Bilangan;**Penjelasan Sistem Digital dan Analog, Sistem bilangan biner, octal, desimal dan heksadesimal, konversi antar sistem bilangan. Peng-kode-an BCD, Excess-3, 8-4-2-1, Gray, dan lain-lain.
- **Aljabar Boole dan penyederhanaan fungsi Boolean:** Gerbang logika OR, AND, NOT, XOR, NAN. Tabel kebenaran, fungsi-fungsi Logika dan implemantasinya ke dalam gerbang logika, Bentuk SOP dan POS, Penyederhanaan fungsi boolean secara matematis dan Teori De Morgan, Penyederhanaan dengan K-Map, dan dengan Tabulasi.
- **Rangkaian Kombinasional:** Adder, Subtractor, Decoder, Encoder, Multiplexer, Demultiplexer. Perancangan rangkaian kombinasional sederhana.
- **Synchronous Sequential Logic:** Konsep rangkaian sequensial yang sinkron, SR Latch, Flip-Flop SR, JK, D, dan T, Pengenalan State Diagram, Analisa rangkaian sekuensial, Merancang rangkaian dengan menggunakan Flip-flop,

- **Register, Counter dan Memory:** Konsep Register, Register dengan Parallel Load, Shift Register, Counter, Binary Up-Down Counter, Memory Decoding, Desain memori, Error Corection, Arsitektur ROM.
- **Algorithmic Satate Machine (ASM):**ASM Chart, ASM Block, Timing Sequence, Desain Rangkaian dengan ASM Chart.
- **Asynchronous Sequential Logic (ASL):** Konsep Dasar ASL, Transition Table, Flow Table, Race Condition. Contoh Desain rangkaian ASL, Penyederhanaan State dan Flow Table

PRASYARAT

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PUSTAKA

- Morris Mano & Cilleti M,, Digital Design (5th Edition), Prentice-Hall, 2012
- Ronald J. Tocci, Neal S. Widmer, Digital Systems Principles and Applications (11th Edition), Prentice-Hall, 2010
- Supeno Djanali, dkk: Bahan Ajar Sistem Digital : e-Learning:SHARE-ITS, <http://share.its.ac.id>”,2012

MATA KULIAH	Nama MK	: Struktur Data
	Kode MK	: IF184202
	Kredit	: 3 SKS
	Semester	: 2

DESKRIPSI MATA KULIAH

Mahasiswa akan mempelajari berbagai macam struktur penyimpanan, penyusunan dan pengaturan banyak data serta algoritma terkait. Konsep abstraksi data dibahas untuk menentukan jenis struktur data secara linear maupun non-linear dengan contoh-contoh permasalahan. Praktikum dalam bahasa C/C++ dilakukan untuk implementasi struktur

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu melakukan abstraksi data pada permasalahan nyata menurut konsep struktur data linear (*stack, queue*), non-linear (*tree, graph*) dan menggunakan C/C++
- Mahasiswa mampu mengimplementasikan algoritma-algoritma akses data pada struktur linear secara statis (*array*) dan dinamis (*linked-list*) dalam menyelesaikan permasalahan yang memperhatikan urutan data masuk (FIFO, LIFO) menggunakan C/C++
- Mahasiswa mampu mengimplementasikan algoritma-algoritma akses data pada struktur nonlinear dalam menyelesaikan permasalahan menggunakan C/C++
- Mahasiswa mampu mengimplentasikan struktur *hash-table* untuk algoritma akses data besar berdasarkan data pencari dalam menyelesaikan permasalahan menggunakan C/C++

POKOK BAHASAN

- abstraksi tipe data: pendahuluan; konsep penyimpanan, penyusunan dan pengaturan banyak data secara linear serta non-linear; contoh menyelesaikan masalah dengan lebih mudah dan efisien menggunakan struktur data sesuai;
- struktur data linear (stack, queue): fungsi push-pop pada stack; fungsi enqueue-dequeue pada queue; fungsi empty, full, dan top untuk cek isi struktur; implementasi stack dan queue menggunakan array, linked-list dan STL untuk menyelesaikan contoh masalah;
- struktur data non linear tree: fungsi-fungsi untuk tambah, hapus dan cari node dalam tree; konsep binary search tree sebagai bentuk khusus tree; konsep graph sebagai bentuk umum tree; algoritma penelusuran data pada struktur tree dan graph; implementasi tree dan graph menggunakan array, linked-list dan STL untuk menyelesaikan contoh masalah;
- algoritma-algoritma pengurutan (selection, insertion, bubble, quick, merge) dan pencarian (binary, hashing) untuk mendukung penyimpanan, penyusunan dan pengaturan banyak data dalam struktur; analisa algoritma;
- struktur data hash table;

PRASYARAT

- Dasar Pemrograman

PUSTAKA

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++ 4ed", Addison-Wesley, New Jersey, 2014
- Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms 2ed", Addison-Wesley, New Jersey, 2013

MATA KULIAH	Nama MK	: Organisasi Komputer
	Kode MK	: IF184305
	Kredit	: 3 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Matakuliah ini menjelaskan dasar kerja komputer dan komponen pembentuknya serta urutan untuk mengeksekusi suatu instruksi. Juga menjelaskan organisasi dan fungsi setiap komponen pembentuk komputer serta menjelaskan konsep pipelining sebagai salah satu cara untuk pemrosesan secara paralel.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;

Keterampilan Khusus:

Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menjelaskan organisasi komputer secara utuh

POKOK BAHASAN

- **Struktur Dasar Komputer:** Organisasi dan arsitektur komputer, struktur komputer dan fungsi-fungsi di dalamnya, evolusi dan generasi-generasi komputer.
- **Instruksi Mesin dan Program:** Lokasi dan alamat memori, operasi dasar memori, instruksi dan urutan instruksi, moda pengalamatan, Bahasa assembly, Stack & Queue, subroutine, contoh beberapa instruction set.
- **Organisasi Input/Output:** Organisasi Input/Output, pengaksesan peralatan I/O, interrupt, Direct Memory Acces, antarmuka I/O standar.
- **Sistem Memory:** Konsep dasar Sistem Memory, Random Access Memory (RAM), Read Only Memory (ROM), Cache Memory: Mapping, Replacement Algorithm, Virtual Memory, and Secondary Storage.
- **Aritmatika:** penambahan dan pengurangan, desain Fast Adder, perkalian bilangan positif, perkalian bilangan bertanda, algoritma

Booth, Fast Multiplication, pembagian bilangan integer. Bilangan riil dan operasinya.

- **Unit Pemrosesan:** Konsep dasar unit processing, eksekusi instruksi lengkap, organisasi bus jamak, Hardwired Control, Multiprogrammed Control.
- **Pipelining:** Konsep dasar pipelining, data & instruction hazard, pengaruh set instruksi, operasi Superscalar

PRASYARAT

Sistem Digital

PUSTAKA

- Supeno Djanali & Baskoro Adi P., *Organisasi Komputer*, ITS Press, 2012
- Hamacher, Vranesic & Zaky, *Computer Organization and Embedded Systems (6th Edition)*, McGraw-Hill, 2011.
- William Stallings, *Computer Organization and Architecture (9th Edition)*, Prentice-Hall, 2012.
- Morris Mano, *Computer System Architecture (3rd Edition)*, Prentice-Hall, 1993.

MATA KULIAH	Nama MK	: Pemrograman Berorientasi Objek
	Kode MK	: IF184301
	Kredit	: 3 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa akan belajar memodelkan permasalahan pemrograman menggunakan konsep pemrograman berbasis objek. Konsep-konsep pemrograman berorientasi objek yang diajarkan antara lain berupa konsep kelas, *inheritance*, *overriding*, *overloading*, polimorfisme, *abstractclass*, dan *interface*. Mahasiswa juga akan diajarkan mengenai daur hidup objek di dalam memori komputer. Selain itu, mahasiswa juga dituntut untuk dapat memanfaatkan pustaka standar di dalam bahasa pemrograman objek (*collections*, *iterator*, GUI). Sehingga pada akhirnya mahasiswa dapat membuat program yang handal (*reliable*).

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

KeterampilanKhusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mengetahui perbedaan konsep pemrograman objek dengan konsep pemrograman prosedural.
- Mahasiswa memahami konsep pemrograman berbasis objek, yaitu definisi kelas dan diagram kelas.
- Mahasiswa mampu memecahkan permasalahan menggunakan pendekatan berorientasi objek.
- Mahasiswa mampu memahami konsep sub kelas, *inheritance*, *overriding*, *overloading*, polimorfisme, *abstract class*, dan *interface*.

- Mahasiswa memahami konsep daur hidup objek (object lifetime and resource management).
- Mahasiswa mampu menggunakan collections, iterator, dan pustaka standar dalam bahasa pemrograman objek.
- Mahasiswa mampu membangun aplikasi berbasis GUI yang berorientasi objek dan multithreading.

POKOK BAHASAN

- Konsep pemrograman prosedural (terstruktur) dan permasalahannya.
- Konsep kelas (fields, methods, constructors) dan objek (state, behaviour).
- Pemodelan dalam diagram kelas.
- Inheritance, overriding, sub-class.
- Dynamic dispatch: definition of method-call.
- Polimorfisme, upcasting dan downcasting.
- Abstract class, interface.
- Konsep object lifetime: constructor, destructor, finalizer, manajemen memory (heap dan stack, garbage collection).
- Pustaka dalam bahasa pemrograman objek: collection, iterator, multithreading, GUI.
- Exception handling.

PRASYARAT

Struktur Data

PUSTAKA

- Deitel, P., & Deitel, H. (2011). C++ How to Program (8th Edition). Prentice Hall.
- Lippman, S. B., Lajoie, J., & Moo, B. E. (2012). C++ Primer (5th Edition). Addison-Wesley Professional.
- McConnell, S. (2004). Code Complete: A Practical Handbook of Software Construction, Second Edition (2nd edition). Microsoft Press.
- Gamma, E., Helm, R., Johnson, R., & Vlissides, J. (1994). Design Patterns: Elements of Reusable Object-Oriented Software (1st edition). Addison-Wesley Professional.

MATA KULIAH	Nama MK	: Aljabar Linier
	Kode MK	: IF184302
	Kredit	: 3 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa belajar menyelesaikan masalah sistem persamaan linier (SPL) dengan menggunakan komputasi matriks. SPL dapat diselesaikan dengan menggunakan eliminasi gauss, Gauss Jordan, Cramer. Agar mahasiswa lebih memahami materi, maka perlu diimplementasikan ke dalam bahasa pemrograman tertentu. Masalah operasi matrix diawali dengan mencari Determinan dan dilanjutkan dengan mencari invers matrix. Determinan dapat dicari dengan menggunakan Operasi Baris Elementer (OBE) dan kofaktor. Invers matrix dapat dicari dengan menggunakan OBE, kofaktor dan Pseudo-inverse. Implementasi ke dalam program juga diperlukan agar mahasiswa lebih mahir. Pada materi Ruang vektor, akan dicari persamaan bidang, persamaan parametrik, persamaan simetrik, dot product, cross product dan transformasi linier. Materi Basis meliputi Merentang, bebas linier, persamaan linier homogen, basis lama dan basis baru, general solusi, basis ruang baris, basis ruang kolom, basis orthonormal, gram schmidt. Berikutnya adalah tentang eigen, yang akan dicari adalah eigenvalue dan eigenvektor, diagonalization, ortogonal diagonalization (praktek menggunakan program). Agar lebih mendalami materi, akan di berikan Contoh-contoh kasus aljabar linier.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi

Keterampilan Khusus:

Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menyelesaikan masalah sistem persamaan linier dengan menggunakan komputasi matriks.

- Mahasiswa mampu menyelesaikan masalah operasi matriks dan Pseudo-inverse.
- Mahasiswa mampu menyelesaikan masalah ruang vektor.
- Mahasiswa mampu mencari basis.
- Mahasiswa mampu menyelesaikan masalah eigen.
- Mahasiswa mampu mengimplementasikan masalah sistem persamaan linier, matrix dan basis ke dalam program
- Mahasiswa mampu mengaplikasikan aljabar linier dalam beberapa contoh kasus

POKOK BAHASAN

Sistem persamaan linier; Eliminasi gauss, Gauss Jordan, Cramer (praktek menggunakan program). Matrix dan operasinya, Determinan, determinan dengan Operasi Baris Elementer (OBE) dan kofaktor. Invers matrix menggunakan OBE, kofaktor (praktek menggunakan program) dan Pseudo-inverse. Ruang vektor; persamaan bidang, persamaan parametrik, persamaan simetrik, dot product, cross product, transformasi. Basis; Merentang, bebas linier, persamaan linier homogen, basis lama dan basis baru, general solusi, basis ruang baris, basis ruang kolom, basis orthonormal, gram schmidt. Eigenvalue dan eigenvektor; eigenvalue dan eigenvektor, diagonalization, ortogonal diagonalization (praktek menggunakan program). Contoh kasus aljabar linier.

PRASYARAT

Kalkulus 2

PUSTAKA

- Elementary Linear Algebra ; Howard Anton, Drexel University, John Wiley & Sons, Inc; ninth edition, 2005
- Elementary Linear Algebra - applications version; Howard Anton, Chris Rorres; John Wiley & Sons, Inc; ninth edition, 2005

MATA KULIAH	Nama MK	: Komputasi Numerik
	Kode MK	: IF184303
	Kredit	: 3 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Mata kuliah ini bertujuan untuk memberikan bekal pengetahuan dan kemampuan komputasi kepada mahasiswa agar mampu menganalisa permasalahan numerik dan melakukan komputasi untuk mencari solusi pendekatan dengan metode yang benar, baik secara mandiri atau juga dalam kerjasama tim.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrogram yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami pengertian bilangan berarti dan pembulatan serta deret Taylor
- Mahasiswa mampu mengaplikasikan metode-metode untuk memperoleh akar persamaan
- Mahasiswa mampu mengaplikasikan metode-metode untuk pencocokan kurva dengan teknik regresi maupun interpolasi
- Mahasiswa mampu mengaplikasikan metode-metode untuk mencari nilai diferensiasi beda-hingga melalui pendekatan numeris

- Mahasiswa mampu mengaplikasikan metode-metode untuk mencari nilai integrasi melalui pendekatan numeris
- Mahasiswa mampu mengaplikasikan metode-metode pendekatan untuk mencari nilai diferensiasi fungsi dengan variabel bebas tunggal (diferensiasi biasa) maupun dengan 2 atau lebih variabel bebas (diferensiasi parsial)

POKOK BAHASAN

- Pengantar Komputasi Numerik
 - Bilangan Berarti
 - Pembulatan Bilangan
 - Kesalahan Pembulatan
 - Deret Taylor
- Akar Persamaan: Metode Akolade
 - Metode Grafik
 - Metode Tabulasi
 - Metode Bolzano
 - Metode Regula Falsi
 - Metode Faktorisasi
 - Metode Quotient-Difference
- Akar Persamaan: Metode Terbuka
 - Metode Iterasi
 - Metode Newton-Raphson
 - Metode Secant
 - Penanganan Akar Ganda
- Akar pada Polinomial
 - Polinomial pada Teknik dan Sains
 - Metode Muller
 - Metode Bairstow
- Pencocokan Kurva (Mengaproksimasi Bentuk Fungsi): Regresi Kuadrat Terkecil
 - Regresi Linier
 - Regresi Polynomial
- Pencocokan Kurva (Mengaproksimasi Nilai Fungsi): Interpolasi
 - Konsep Bada-Hingga
 - Interpolasi Newton-Gregory
 - Interpolasi Gauss
 - Interpolasi Lagrange
 - Interpolasi Hermite
- Diferensiasi Bada-Hingga
 - Interpolasi Newton-Gregory
 - Interpolasi Gauss

- Interpolasi Lagrange
- Interpolasi Hermite
- Integrasi Numerik
 - Metode Trapezioda
 - Metode Simpson
 - Metode Kuadratur
 - Metode Rhomberg
- Persamaan Diferensial Biasa
 - Metode Euler-Cauchy
 - Metode Heun
 - Metode Picard
 - Metode Taylor
 - Metode Runge-Kutta
 - Metode Adam
 - Metode Milne
 - Metode Adam-Moulton
- Persamaan Diferensial Parsial
 - PDP Eliptik
 - PDP Parabolik
 - PDP Hiperbolik

PRASYARAT

Kalkulus 2

PUSTAKA

- Chapra, S.C., Canale, R.P., "Numerical Methods for Engineers 6th Ed", McGraw-Hill, 2010
- Hariadi, V., "Bahan Ajar Komputasi Numerik", 2014

MATA KULIAH	Nama MK	: Matematika Diskrit
	Kode MK	: IF184304
	Kredit	: 3 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Dalam mata kuliah ini, mahasiswa akan belajar konsep logika, metode-metode pembuktian, struktur diskrit yang meliputi himpunan, fungsi dan relasi, konsep penghitungan, dan rekursif. Tujuan dari mata kuliah ini mahasiswa mampu menjelaskan konsep logika, metode pembuktian, himpunan, fungsi, induksi matematis & rekursi, relasi dan dapat mengaplikasikannya pada permasalahan nyata, baik dengan kinerja individu maupun secara berkelompok dalam kerjasama tim. Mata kuliah ini merupakan prasyarat untuk mata kuliah Aljabar Linier, PAA I, Teori Graf, Statistik, dan Otomata.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;

Keterampilan Khusus:

Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan konsep logika dan penarikan kesimpulan
- Mahasiswa mampu mengaplikasikan metode-metode pembuktian
- Mahasiswa mengaplikasikan konsep himpunan dan fungsi
- Mahasiswa mengaplikasikan induksi matematis dan rekursi pada permasalahan nyata
- Mahasiswa mengaplikasikan konsep relasi pada permasalahan nyata

POKOK BAHASAN

- **KONSEP DASAR LOGIKA:** Konsep logika proposisi dan ekuivalensi, konsep predikat dan quantifier, penggunaan quantifier pada proposisi, dan konsep aturan penentuan kesimpulan.
- **KONSEP DASAR METODE-METODE PEMBUKTIAN:** Konsep metode-metode pembuktian seperti bukti langsung, bukti dengan kontraposisi, bukti dengan kontradiksi.

- KONSEP DASAR STRUKTUR DISKRIT: Definisi himpunan, operasi pada himpunan, konsep fungsi, konsep relasi, relasi ekuivalen, partial ordering.
- METODE PEMBUKTIAN DENGAN INDUKSI DAN REKURSI: Konsep induksi matematis, konsep induksi kuat, metode pembuktian dengan induksi kuat dan well ordering, definisi rekursif, induksi struktural.
- KONSEP DASAR PENGHITUNGAN: Dasar-dasar penghitungan, pigeonhole principle, permutasi dan kombinasi, koefisien Binomial dan Identitas, relasi rekuren dan aplikasinya, solusi relasi rekuren.

PRASYARAT

-

PUSTAKA

- Kenneth H. Rosen, "Discrete Mathematics and its Applications 7th edition", McGraw Hill Incorporated, New York, 2012.
- Andrew Simpson, "Discrete Mathematics by Example", McGraw-Hill Incorporated, New York, 2002.
- Norman L. Biggs, "Discrete Mathematics", Oxford University Press, 2002.

MATA KULIAH	Nama MK	: Sistem Basis Data
	Kode MK	: IW184301
	Kredit	: 4 SKS
	Semester	: 3

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa akan belajar tentang bagaimanamemodelkan data dan informasi dalam bentuk diagram konsep dan diagram fisik serta menerapkannya ke dalam basis data dalam suatu DBMS menggunakan DDL. Mahasiswa juga belajar tentang konsep aljabar relasional dan DML serta penerapannya untuk mengelola data dan informasi dalam basis data. Mahasiswa juga belajar membuat aplikasi basis data untuk memanipulasi data dalam basis data. Perkuliahan dan praktek dilakukan di dalam kelas maupun laboratorium secara individual dan kelompok. Studi kasus yang digunakan dalam perkuliahan adalah studi

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memodelkan data dan informasi dalam bentuk diagram konsep dan diagram fisik serta menerapkannya ke dalam basis data dalam suatu DBMS, baik secara individual maupun kerja sama tim
- Mahasiswa mampu menerapkan konsep aljabar relasional, DDL, dan DML untuk mengelola data dan informasi dalam basis data
- Mahasiswa mampu membuat aplikasi basis data untuk memanipulasi data dalam basis data

POKOK BAHASAN

- KONSEP DASAR MANAJEMEN INFORMASI: perbedaan data, informasi dan pengetahuan ; manfaat data dan informasi untuk mendukung kebutuhan manusia; demonstrasi pemanfaatan data dan informasi bagi organisasi; identifikasi isu penggunaan data persisten pada

organisasi; evaluasi penggunaan aplikasi skala kecil sampai menengah untuk memenuhi kebutuhan pengguna yang sesungguhnya.

- **SISTEM BASIS DATA:** karakteristik yang membedakan pendekatan database dengan pendekatan tradisional dengan pemrograman dengan file data; evolusi dan pendekatan sistem basis data; tujuan dasar, fungsi, model, komponen aplikasi dan impact social dari sistem basis data; identifikasi fungsi utama dari DBMS dan mendeskripsikan perannya dalam sistem basis data; konsep independensi data dan pentingnya dalam sistem basis data; penggunaan bahasa query deklaratif untuk mendapatkan informasi dari basis data;
- **PEMODELAN DATA:** kategori model data berdasarkan tipe konsep yang disediakan untuk mendeskripsikan struktur basis data (model data konsep, model data fisik, dan model data representasional), konsep pemodelan dan penggunaan notasi pemodelan (ERD, UML); model data relasional, prinsip dasar model data relasional, konsep pemodelan dan notasi dari model data relasional; konsep utama model OO seperti identity, tipe konstruktor, inheritance, polimorphisme, dan versioning; perbedaan model data relasional dengan model data semi terstruktur (DTD, XML Schema).
- **BASIS DATA RELASIONAL:** skema relasional dari model konseptual yang dibuat menggunakan model ER; perancangan database relasional; konsep batasan integritas dan batasan integritas referensial; penggunaan operasi aljabar relasional dari teori set matematika (union, intersection, difference, dan Cartesian product) dan operasi aljabar relasional untuk database (select (restrict), project, join, dan division); query dalam aljabar relasional dan tuple relational calculus; Ketergantungan fungsional antara dua atau lebih atribut yang merupakan subset relasi, Decomposition of a schema; lossless-join and dependency-preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued dependency (4NF), Join dependency (PJNF, 5NF), Representation theory
- **BAHASA QUERY:** bahasa database, SQL (DDL dan DML untuk mendefinisikan struktur data, query, update, batasan-batasan, integritas); QBE dan 4th-generation environments, Nested Queries & Set Comparison. Fungsi EXISTS & NOT EXISTS, Eksplisit Set & NULL, Penamaan Kembali, Fungsi Aggregate & Grouping, Substring Comparison, Arithmetic Operator & Ordering, VIEW dalam SQL
- **APLIKASI BASIS DATA**

PRASYARAT

Struktur Data

PUSTAKA

- Ramakrishnan, Raghu, Gehrke, Johannes. 2003. Database Management Systems, Third Edition. New York: The McGraw-Hill Companies, Inc.
- Howe, David; Data analysis for Database Design, third Edition, Butterworth-Heineman, 2001

MATA KULIAH	Nama MK	: Sistem Operasi
	Kode MK	: IF184402
	Kredit	: 4 SKS
	Semester	: 4

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa akan belajar mengenai konsep dasar-dasar sistem operasi dan mempraktekannya. Perkuliahan dilakukan di kelas dan praktik dilakukan di kelas maupun di laboratorium. Mahasiswa akan belajar tentang konsep sistem operasi beserta manajemen dan strukturnya.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;

Keterampilan Khusus:

Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami dan menerapkan konsep dasar sistem operasi sebagai jembatan antara perangkat keras dengan perangkat lunak
- Mahasiswa mampu memahami daur hidup proses dalam sistem operasi dan menerapkan komunikasi antar proses dalam sistem operasi
- Mahasiswa mampu memahami dan menerapkan mekanisme sinkronisasi multiproses dan multithread
- Mahasiswa mampu memahami dan menerapkan konsep manajemen memori, beberapa algoritma page replacement, mekanisme paging dan segmentasi
- Mahasiswa mampu memahami dan menerapkan beberapa algoritma penjadwalan proses
- Mahasiswa mampu memahami keterhubungan perangkat keras I/O dan perangkat lunak I/O
- Mahasiswa mampu memahami dan menerapkan Sistem Berkas (File System)
- Mahasiswa mampu memahami tipe-tipe serangan dan mekanisme pengamanannya pada sistem operasi

POKOK BAHASAN
• Konsep dasar sistem operasi, daur hidup proses dalam sistem operasi, komunikasi antar proses dalam sistem operasi. • Mekanisme sinkronisasi multiproses dan multithread • Manajemen memori, algoritma page replacement, mekanisme paging dan segmentasi • Penjadwalan proses dan algoritma penjadwalan proses • Keterhubungan perangkat keras I/O dan perangkat lunak I/O • Sistem berkas (File System) • Tipe-tipe serangan dan mekanisme pengamanannya pada sistem operasi
PRASYARAT
Organisasi Komputer
PUSTAKA
William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall.

MATA KULIAH	Nama MK	: Perancangan dan Analisis Algoritma
	Kode MK	: IF184401
	Kredit	: 4 SKS
	Semester	: 4

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa akan belajar mengenai perancangan dan analisis algoritma dalam pemrograman. Konsep-konsep perancangan dan algoritma yang dibahas antara lain perhitungan kompleksitas algoritma dalam notasi asimtotik, menganalisis kebenaran menggunakan loop invariant dari algoritma iteratif (straight-forward) dan divide-conquer. Mahasiswa juga diharapkan mampu menjelaskan strategi dan analisis rancangan serta implementasi algoritma rekursif dan non rekursif untuk menyelesaikan permasalahan-permasalahan program yang nyata.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan peranan algoritma dalam komputasi
- Mahasiswa mampu menjelaskan, merepresentasikan dan menghitung kompleksitas algoritma dalam notasi asimtotik (big-oh, theta, little-oh)
- Mahasiswa dapat menganalisis kebenaran menggunakan loop invariant dari algoritma straight-forward/iteratif dan divide-conquer
- Mahasiswa dapat menjelaskan strategi dan analisis rancangan serta implementasi algoritma rekursif dan non rekursif untuk menyelesaikan problem-problem real.

POKOK BAHASAN

- definisi algoritma, dasar-dasar problem solving secara algoritmis, jenis-jenis problem utama, review struktur data
- notasi asimtotik, notasi standar, fungsi-fungsi umum
- analisis algoritma rekursif dan non rekursif (master theorem)

PRASYARAT

Struktur Data

PUSTAKA

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms Third Edition", MIT Press, 2009
- Levitin, Anany, "Introduction to The Design & Analysis of algorithms 3rd ed", Addison-Wesley, 2012

MATA KULIAH	Nama MK	: Probabilitas dan Statistik
	Kode MK	: IF184405
	Kredit	: 3 SKS
	Semester	: 4

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar memahami Ruang Sampel, Ruang Kejadian, Aksioma probabilitas dan Menghitung Probabilitas, Probabilitas Bersyarat, Teorema Bayes, Probabilitas Diskrit dan Kontinu, Ekspektasi, Distribusi Sampling, Estimasi, Uji Hipotesis, Analisis Variansi dan Principle Component Analysis.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrogram yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa dapat menjelaskan konsep dasar statistika dalam kaitan dengan analisis data.
- Mahasiswa dapat memodelkan probabilitas atas suatu kejadian dari suatu percobaan random.
- Mahasiswa dapat memodelkan percobaan random dengan pendekatan teorema bayes.

- Mahasiswa dapat memodelkan percobaan random dengan pendekatan variabel random.
- Mahasiswa dapat menghitung probabilitas dari variabel random diskrit dan kontinu dengan berbagai macam distribusi khusus.
- Mahasiswa dapat menjelaskan konsep ekspektasi, variansi, ko-variansi dan korelasi.
- Mahasiswa dapat menjelaskan konsep pendekatan antar distribusi probabilitas dan Teorema Chebyshev.
- Mahasiswa menguasai pendekatan parameter populasi dengan sampel.
- Mahasiswa dapat menghitung estimator dari parameter populasi dan mengambil kesimpulan.
- Mahasiswa dapat melakukan uji hipotesis dari parameter populasi dan mengambil kesimpulan.
- Mahasiswa dapat membuat model anova atas data multiatribut berskala nominal/rasio.
- Mahasiswa dapat menerapkan rancangan percobaan orthogonal untuk menganalisis pengaruh multi faktor.
- Mahasiswa dapat membuat model PCA untuk mereduksi dimensi data.

POKOK BAHASAN

Ruang Sampel, Ruang Kejadian, Aksioma probabilitas dan Menghitung Probabilitas, Probabilitas Bersyarat, Teorema Bayes, Variabel Random, Probabilitas Diskrit dan Kontinu, Ekspektasi, Distribusi Sampling, Estimasi, Uji Hipotesis, Anova, dan PCA

PRASYARAT

Matematika Diskrit

PUSTAKA

- Ronald E.Walpole, Raymond H.Myers, “Probability & Statistics for Engineers & Scientists”, 9th Edition, Prentice-Hall Inc., 2010.
- Michael Baron, “Probability & Statistics for Computer Scientists”, Chapman & Hall, 2007.
- Sheldon Ross, “A First Course in Probability”, Prentice Hall, 9th Edition, 2012.

MATA KULIAH	Nama MK	: Kecerdasan Buatan
	Kode MK	: IF184403
	Kredit	: 3 SKS
	Semester	:4

DESKRIPSI MATA KULIAH

Pada matakuliah ini, mahasiswa akan belajar tentang intelligent agent baik secara teori di kelas maupun praktek melalui tugas project. Intelligent agent akan memanfaatkan algoritma pencarian (search), algoritma berbasis pengetahuan (knowledge-based) serta algoritma pembelajaran (learning-based.) Algoritma search yang dipelajari antara lain algoritma uninformed/informed search, heuristic search, adversarial search dan algoritma search untuk constraint satisfaction problem. Sedangkan algoritma berbasis pengetahuan meliputi representasi serta inference propositional logic, first order logic, reasoning under uncertainty. Untuk algoritma yang berbasis pembelajaran, di mata kuliah ini akan dibahas tentang algoritma statistical learning. Selain teori, di dalam kuliah ini akan disampaikan studi kasus dalam bentuk tugas project yang berkaitan dengan intelligent agent yang memanfaatkan algoritma pencarian, algoritma berbasis pengetahuan atau algoritma statistical learning. Tugas project dapat dikerjakan secara individu maupun secara berkelompok, sehingga mahasiswa memiliki pengalaman belajar dan mampu berfikir secara kritis tentang penerapan intelligent agent.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Ketrampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa menguasai konsep kecerdasan buatan, intelligent agent serta mengidentifikasi problem yang dapat diselesaikan dengan memanfaatkan intelligent agent

- Mahasiswa mampu menjelaskan, mengidentifikasi, merancang dan menerapkan intelligent agent dengan memanfaatkan algoritma pencarian yang meliputi uninformed search, informed search, heuristic search, adversarial search serta algoritma search untuk Constraint Satisfaction Problem
- Mahasiswa mampu menjelaskan, merancang dan menerapkan knowledge-based intelligent agent dengan merepresentasikan KB menjadi propositional logic atau first order logic serta memanfaatkan algoritma resolution, forward dan backward chaining untuk melakukan proses inference.
- Mahasiswa mampu menjelaskan, merancang dan menerapkan first order logic untuk merepresentasikan aspek action, space, time dan mental event menggunakan ontology dan reasoning yang sesuai.
- Mahasiswa mampu menjelaskan, merancang dan menerapkan intelligent agent untuk problem yang berada dalam kondisi ketidak pastian menggunakan bayesian network dan probabilistic reasoning.
- Mahasiswa mampu menjelaskan, merancang dan menerapkan intelligent agent yang memanfaatkan algoritma statistical learning.

POKOK BAHASAN

Konsep kecerdasan buatan, Intelligent Agent, Algoritma Pencarian (uninformed search, informed search, heuristic search, adversarial search dan algoritma search untuk Constraint Satisfaction Problem), Representasi dan Inference (resolution, forward-chaining dan backward chaining) Propositional Logic dan First Order Logic, Reasoning under Uncertainty dan Statistical Learning (Bayesian learning, maximum a posteriori approximation (MAP), maximum likelihood approximation, parameter learning, naïve bayes model, parameter learning, EM algorithm, log-likelihood function, hidden markov model, maximization, miss data, E-step, M-step, mixed attributes example)

PRASYARAT

Struktur Data

PUSTAKA

- Russel & Norvig, Artificial Intelligence : A Modern Approach
- R.O. Duda, P.E.Hart, D.G.Stork, Pattern Classification, John Wiley & Sons, Inc., 2001
- Amit Konar, Computational Intelligence, Springer, 2005.
- C. H. Bishop, Pattern Recognition and Machine Learning, Springer Science, 2006

MATA KULIAH	Nama MK	: Manajemen Basis Data
	Kode MK	: IF184404
	Kredit	: 3 SKS
	Semester	: 4

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan mempelajari tentang pemodelan sistem kompleks di bidang industri sesuai dengan business rule yang diterapkan pada studi kasus. Dari pemodelan yang telah dibuat sebelumnya, mahasiswa akan menerapkan SQL Programming dan melakukan administrasi database untuk mendapatkan performa yang optimal. Dengan penyampaian materi dalam bentuk perkuliahan di kelas dan praktik proyek kecil, diharapkan mahasiswa memiliki pengalaman dalam mengelola dan menangani permasalahan yang sering muncul pada data berskala besar. Dalam kuliah ini, akan disampaikan juga pengetahuan lanjut mengenai basis data terdistribusi dan data warehouse.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memodelkan basis data di berbagai bidang industri.
- Mahasiswa mampu menangani permasalahan data berskala besar.
- Mahasiswa mampu memodelkan basis data aktif yang terintegrasi dengan business rule.

POKOK BAHASAN

Pemodelan Sistem Kompleks: studi kasus spesifik di bidang industri. SQL Programming: trigger, stored procedure, function, view. Indeks: B+Tree, Bitmap, Hash, Clustered dan Unclustered indeks. Optimasi basis data: rancangan optimasi, administrative tuning. SQL Transaction Processing: transaction, failure and recovery, concurrency and control. XML dalam basis data. Basis data terdistribusi. Data warehouse.

PRASYARAT

Sistem Basis Data minimal memperoleh nilai C

PUSTAKA

- Avi Silberschatz, “Database System Concepts”, 5th edition, 2002.
- Morgan Kaufman, “Advanced Database System”, Morgan Kaufman Publisher Inc., 1993.
- Howe, David, “Data Analysis for Database Design”, 3th edition. Butterworth-Heineman, 2001.
- Ramakrishnan, Raghu, Gehrke, Johannes. “Database Management Systems”, 3th ed., New York: The McGraw-Hill Companies Inc., 2003.

MATA KULIAH	Nama MK	: Analisis dan Perancangan Sistem Informasi
	Kode MK	: IF184406
	Kredit	: 3 SKS
	Semester	: 4

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa mampu melakukan analisis system yang diawali dengan menetapkan kebutuhan, Teknik-teknik mendapatkan kebutuhan, Strategi menganalisis kebutuhan. Mahasiswa mampu memodelkan kebutuhan dengan menggunakan notasi, metode dan tools yang ada seperti DFD, Kamus Data, UML (Obyek), FDD, ERD. Meliputi pemodelan proses dan pemodelan data.

Mahasiswa mampu melakukan translasi hasil analisis ke perancangan yang meliputi: Perancangan Arsitektur, Perancangan Antarmuka pengguna, perancangan program, Perancangan penyimpanan Data.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basis data sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;
- Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

- Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami peran Analisis Sistem.
- Mahasiswa mengetahui pengembangan Sistem Informasi
- Mahasiswa mampu memahami proses bisnis dan menetapkan kebutuhan pengguna.
- Mahasiswa mampu memodelkan kebutuhan dengan pemodelan proses, data dan obyek.
- Mahasiswa memahami dan menerapkan strategi pengembangan Sistem Informasi.
- Mahasiswa mampu mentranslasi hasil pemodelan analisis ke perancangan yang meliputi perancangan arsitektur, antarmuka pengguna dan laporan, program dan penyimpanan data.

POKOK BAHASAN

- Analisis Sistem dan Pengembangan Sistem Informasi: Analisis Sistem (kompetensi, peran). Pengembangan Sistem Informasi Siklus Hidup Pengembangan Sistem (Perencanaan, Analisis, Perancangan dan Implementasi). Identifikasi dan Inisiasi proyek Sistem Informasi, Analisis kelayakan proyek (Teknis, Ekonomi dan organisasi).
- Tahap Analisis: Penetapan Kebutuhan (memahami proses bisnis, domain permasalahan, organisasi, stakeholder) Teknik mendapatkan kebutuhan (Interview, Kuisioner, Pengamatan, Analisis Dokumen, memilih teknik-teknik yang sesuai). Strategi melakukan analisis kebutuhan (Analisis Permasalahan, Analisis akar permasalahan, Kegiatan berbasis biaya)
- Pemodelan Kebutuhan: Pemodelan Proses (Data Flow Diagram, Kamus Data, Functional Decomposition Diagrams). Pemodelan Data (Entity Relationship Diagram/ Conceptual Data Model). Pemodelan Obyek (Use Case Diagram, Activity Diagram, Sequence Diagram, Analisis Kelas, Kelas Diagram level analisis).
- Strategi Pengembangan: Dampak Internet (SaaS, Web Based System Development, Cloud Computing), Outsourcing, In House Software Development option, Peran Analisis Sistem, Analisis Biaya dan Manfaat, Proses akuisisi Perangkat Lunak, Transisi system ke perancangan, Panduan perancangan system, Prototyping, Tren pengembangan perangkat lunak.
- Tahap Perancangan: Perpindahan Analisis ke Perancangan, Perancangan Arsitektur (Elemen-elemen, Client Server, Perancangan Antar Muka Pengguna dan Laporan, Perancangan Program dan Perancangan Penyimpanan Data).

PRASYARAT

Struktur Data

PUSTAKA

- Dennis Wixom Roth, System Analysis & Design, 5 th, Wiley, 2009
- Shelly Rosenblatt, Systems Analysis and Design, 8 th, Course Technology, 2010
- Ian. Sommerville, Software Engineering, 9th ed., Addison-Wesley, 2011.
- M. Page-Jones, Fundamentals of Object-Oriented Design in UML, 1st ed., Addison-Wesley, 1999

MATA KULIAH	Nama MK	: Jaringan Komputer
	Kode MK	: IF184505
	Kredit	: 4 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai cara komunikasi antar komputer. Bagaimana data bisa terkirim dari satu komputer ke komputer lain berdasarkan konsep OSI Layer

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;

Keterampilan Khusus:

Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu memahami konsep transmisi data pada jaringan komputer dan kegunaan dari masing-masing layer pada OSI layer. Selain itu juga mampu mengaplikasikan pada aplikasi yang ada dan mendesain jaringan komputer, baik dengan kinerja individu maupun secara berkelompok dalam kerjasama tim.

POKOK BAHASAN

- Pengenalan Jaringan Komputer: manfaat jaringan komputer, perangkat keras jaringan, perangkat lunak jaringan, perbandingan model OSI dan TCP/IP, sejarah internet, dan standarisasi jaringan.
- Protokol Layer Aplikasi: HTTP, Email, FTP, P2P, aplikasi server
- Protokol Layer Transport: layanan pada lapisan transport, elemen pada protokol lapisan transport, protokol transport sederhana, UDP, TCP
- Protokol Layer Network: Internet Protocol version 4 (IPv4), subnetting, routing
- Protokol Layer Datalink: Ethernet, ARP, WiFi, Bluetooth
- Manajemen Jaringan: Dasar manajemen jaringan.
- Pengiriman Data: Unicast, Broadcast, Multicast.

PRASYARAT

Sistem Operasi

PUSTAKA

James F. Kurose and Keith W. Ross, Komputer Networking: A Top-Down Approach, 7th Edition, Addison Wesley, 2013.

MATA KULIAH	Nama MK	: Pemrograman Web
	Kode MK	: IF184504
	Kredit	: 3 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Mahasiswa memiliki pemahaman yang mendalam, kritis dan sistematis tentang karakteristik dan prinsip desain website yang baik, mampu mendemonstrasikan bagaimana teknologi web digunakan pada situs-situs web terkini.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;
- Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memiliki pemahaman perkembangan teknologi web dan dasar-dasar HTML.

- Mahasiswa memiliki kemampuan membuat aplikasi client-side menggunakan XHTML, CSS, PHP dan JavaScript.
- Mahasiswa mampu membuat aplikasi web sederhana
- Mahasiswa mampu membuat sistem informasi sederhana berbasis web dengan ADO.NET.
- Mahasiswa mampu membuat aplikasi web service.

POKOK BAHASAN

- Perkembangan teknologi web: sejarah internet dan www,
- Dasar-dasar HTML: tag HTML, komponen dan atribut HTML
- Pembuatan aplikasi client-side menggunakan XHTML, CSS, PHP dan JavaScript.
- Pengenalan ASP dan ASP.NET (dan bahasa pemrograman web lain)
- Pengenalan web form, kelas page
- Dasar-dasar ADO.NET
- Pengenalan web service

PRASYARAT

Pemrograman Berorientasi Objek

PUSTAKA

Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 4th Edition, Pearson Education, Inc. , Upper Saddle River, NJ., 2008.

MATA KULIAH	Nama MK	: Grafika Komputer
	Kode MK	: IF184502
	Kredit	: 3 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa diberikan berbagai materi dan praktek agar mampu membuat program aplikasi grafik interaktif untuk mendesain objek tertentu yang sesuai dengan kebutuhan user di dunia nyata menggunakan pustaka grafika (misalnya OpenGL, Direct3D).

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer;

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan dasar-dasar sistem grafika dan graphics pipeline dalam pustaka grafika.
- Mahasiswa mampu mendemonstrasikan program grafik sederhana, berdasarkan contoh.
- Mahasiswa mampu membuat program grafik yang memanfaatkan World Windows dan Viewport.
- Mahasiswa mampu membuat program aplikasi grafik interaktif sederhana.
- Mahasiswa mampu menjelaskan vector tools.
- Mahasiswa mampu menjelaskan konsep geometri, representasi, dan transformasi objek.
- Mahasiswa mampu membuat program grafik yang melibatkan konsep transformasi objek.
- Mahasiswa mampu menjelaskan konsep pemodelan objek menggunakan Polygonal Meshes.
- Mahasiswa mampu menjelaskan konsep hirarki dalam pemodelan objek 2D dan 3D.

- Mahasiswa mampu menerapkan konsep 3D viewing ke dalam program grafik.
- Mahasiswa mampu menerapkan konsep rendering ke dalam program grafik.
- Mahasiswa mampu menjelaskan konsep raster display.
- Mahasiswa mampu menerapkan konsep penggambaran kurva dan permukaan ke dalam program grafik.

POKOK BAHASAN

Dasar-dasar sistem grafika dan pemrograman grafika menggunakan pustaka grafika (OpenGL dan Direct3D), World window dan viewport, Vector tool, Transformasi, Polygonal Mesh, Pemodelan hirarki, Viewing, Rendering, Raster display, Kurva dan permukaan.

PRASYARAT

Pemrograman Berorientasi Objek

PUSTAKA

- FS Hill Jr, "Computer Graphics using OpenGL".
- Edward Angel, "Interactive Computer Graphics: A Top-Down Approach Using OpenGL", Sixth Edition, Pearson International Inc, 2012.
- Edward Angel, "OpenGLTM: A Primer", Third Edition, Addison-Wesley, 2002.
- Frank Luna, "Introduction to 3D Game Programming with DirectX 11", Mercury Learning & Information, 2012.
- Jason Zink, "Practical Rendering and Computation with Direct3D", A K Peters, 2011.
- Donald Hearn and M. Pauline Baker, "Computer Graphics with OpenGL", 3rd Edition.
- Alan Watt, "3D Computer Graphics", Addison-Wesley.

MATA KULIAH	Nama MK	: Kecerdasan Komputasional
	Kode MK	: IF184503
	Kredit	: 3 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa belajar tentang metode klasifikasi, metode clustering, metode optimasi, fuzzy logic serta kombinasi metode-metode tersebut. Melalui pembahasan teoritis di kelas serta penerapan studi kasus dalam bentuk tugas proyek, mahasiswa akan memiliki pengalaman untuk membuat sistem cerdas dengan pembelajaran yang terawasi berdasarkan metode klasifikasi (Decision Tree, SVM, Jaringan Syaraf Tiruan), membuat sistem cerdas berdasarkan pembelajaran tidak terawasi berdasarkan metode clustering (K-Means, Hierarchical Clustering, SOM), membuat sistem cerdas menggunakan logika Fuzzy, membuat sistem cerdas berdasarkan metode optimasi (GA, PSO, ACO), serta membuat sistem cerdas yang mengkombinasikan metode-metode tersebut. Tugas proyek dapat dikerjakan baik secara individu maupun berkelompok

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan klasifier dengan fungsi diskriminan linier maupun non-linier, Perceptron, Support Vector Machine (SVM).
- Mahasiswa mampu menjelaskan Fuzzy Logic dan penggunaannya dalam sistem berbasis aturan, contoh sistem kontroler.
- Mahasiswa mampu menjelaskan Decision Tree dan pembentukan strukturnya yang optimal serta terjadinya overfitting.
- Mahasiswa mampu menerapkan metode yang sudah dibahas seperti SVM, Fuzzy Logic, dan Decision Tree, dalam suatu aplikasi.
- Mahasiswa mampu menjelaskan berbagai metode clustering dan penggunaannya.

- Mahasiswa mampu menjelaskan metode jaringan saraf tiruan dengan algoritma Backpropagation, non-linearly separable problems, neuro-fuzzy, dan SOM.
- Mahasiswa mampu menerapkan metode clustering dan jaringan saraf tiruan dalam suatu aplikasi.
- Mahasiswa mampu menjelaskan metode optimasi dengan evolutionary algorithm: Genetic Algorithm (GA), Ant Colony (ACO), Particle Swarm Optimization (PSO).

POKOK BAHASAN

- **KLASIFIER LINIER:** Fungsi diskriminan linier, multi kategori, algoritma Perceptron, Support Vector Machine (SVM), fungsi diskriminan non-linier.
- **FUZZY LOGIC (MULTI-VALUED LOGIC):** definisi, linguistic variables, crisp vs fuzzy set, membership function, fuzzification, inference mechanism, defuzzification, rules, fungsi Mamdani.
- **DECISION TREE:** contoh pengamatan, multivariate tree, entropy, information gain, overfitting
- **CLUSTERING:** persyaratan clustering, outliers, tipe data, similaritas, disimilaritas, variabel dengan tipe berbeda, K-Means Clustering, Fuzzy C-Means Clustering, Hierarchical Clustering: Agglomerative dan Divisive Clustering, Nearest Neighbor, K-Nearest Neighbor,
- **JARINGAN SARAF TIRUAN:** neuron, perceptron, supervised learning, multilayer neural network, algoritma Backpropagation, non-linearly separable problems, SOM: Kohonen.
- **EVOLUTIONARY ALGORITHM:** Genetic Algorithm (GA): definisi kromosom, mutation, crossover, fitness, selection, Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO)..

PRASYARAT

Kecerdasan Buatan

PUSTAKA

- Sergios Theodoridis, Konstantinos Koutroumbas, Pattern Recognition, 4th ed., Elsevier Inc., 2009.
- R.O. Duda, P.E.Hart, D.G.Stork, Pattern Classification, John Wiley & Sons, Inc., 2001
- Amit Konar, Computational Intelligence, Springer, 2005.
- C. H. Bishop, Pattern Recognition and Machine Learning, Springer Science, 2006
- Simon Haykin, Neural Networks: A Comprehensive Foundation (2nd Edition), Prentice Hall, 1998.

MATA KULIAH	Nama MK	: Perancangan Perangkat Lunak
	Kode MK	: IF184501
	Kredit	: 3 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa memahami prinsip-prinsip perancangan perangkat lunak, mampu mengurai kompleksitas pada domain permasalahan, mampu memilih pendekatan yang sesuai dengan domain permasalahan, mampu memilih arsitektur yang sesuai dengan perangkat lunak yang akan dibangun, mampu menggunakan pola-pola perancangan pada suatu permasalahan perancangan. Mahasiswa bisa membangun model perancangan perangkat lunak yang mampu mengantisipasi perubahan sesuai dengan studi kasus yang diberikan menggunakan pendekatan tertentu.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan prinsip-prinsip perancangan.
- Mahasiswa mampu mampu mengurai kompleksitas pada domain permasalahan.
- Mahasiswa menjelaskan dan memilih pendekatan-pendekatan pada perancangan perangkat lunak sesuai dengan domain permasalahan.
- Mahasiswa mampu mengidentifikasi tipe-tipe arsitektur perangkat lunak dan perbedaan antar arsitektur perangkat lunak.

- Mahasiswa mampu menggambarkan detail sistem pada lower-level dengan menggunakan pola-pola perancangan yang sesuai dengan permasalahan.
- Mahasiswa mampu mengadopsi kerangka kerja (framework) pada perancangan dengan meminimalkan kopling antara sistem yang dibuat dengan kerangka kerja yang digunakan.
- Mahasiswa mampu membuat perancangan antarmuka.
- Mahasiswa mampu menerapkan perancangan perangkat lunak pada studi kasus sederhana.

POKOK BAHASAN

Prinsip-prinsip perancangan perangkat lunak: abstraksi; kopling dan kohesi; dekomposisi dan modularisasi; enkapsulasi; pemisahan antara antarmuka dan implementasi; *sufficiency*, *completeness*, dan *primitiveness*; serta *separation of concerns*. **Isu-isu kunci perancangan perangkat lunak:** konkurensi, penanganan *event*, persistensi data, penanganan error, toleransi terhadap kesalahan, keamanan, dll. **Tipe-tipe perangkat lunak.** **Pendekatan perancangan perangkat lunak:** *top-down*, *bottom-up*, *function-oriented*, *data structure-centered*, *object-oriented*, dan *component-based*. **Konsep-konsep arsitektur perangkat lunak:** *client-server*, *three-tier*, *Model-View-Controller*, dll. **Pola-pola perancangan:** beberapa pola sesuai dengan permasalahan seperti *creational patterns*, *structural patterns*, dan *behavioral patterns*. **Penggunaan kembali kerangka kerja.** **Perancangan antarmuka.**

PRASYARAT

Pemrograman Berorientasi Obyek , Pemrograman Web (ambil)

PUSTAKA

- D. Budgen, Software Design, 2nd ed., Addison-Wesley, 2003.
- Robert C. Martin and Micah Martin, Agile Principles, Patterns, and Practices in C#, Prentice Hall, 2006.
- I. Sommerville, Software Engineering, 9th ed., Addison-Wesley, 2011.
- E. Gamma et al., Design Patterns: Elements of Reusable Object-Oriented Software, 1st ed., Addison-Wesley Professional, 1994.
- P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014.

MATA KULIAH	Nama MK	: Manajemen Proyek Perangkat Lunak
	Kode MK	: IF184506
	Kredit	: 3 SKS
	Semester	: 5

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa memahami prinsip-prinsip manajemen proyek perangkat lunak, mampu mengurai kompleksitas pada domain permasalahan, mampu memilih pendekatan yang sesuai dengan domain permasalahan, mampu memilih arsitektur yang sesuai dengan perangkat lunak yang akan dibangun, mampu menggunakan pola-pola perancangan pada suatu permasalahan perancangan. Mahasiswa bisa membangun model perancangan perangkat lunak yang mampu mengantisipasi perubahan sesuai dengan studi kasus yang diberikan menggunakan pendekatan tertentu.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menganalisis permasalahan bisnis & sumber daya, resiko, dan permasalahan teknologi
- Mahasiswa mampu merencanakan pengembangan perangkat lunak secara iteratif (aktivitas, jadwal, resource assignment, implementasi metode)
- Mahasiswa mampu merencanakan anggaran dan mengendalikan biaya
- Mahasiswa mampu menilai kualifikasi anggota Tim dan memberikan penugasan yang sesuai
- Mahasiswa memiliki kemampuan komunikasi yang baik

- Mahasiswa mampu bekerjasama dalam tim
- Mahasiswa mengetahui aspek legal terkait proyek
- Mahasiswa mampu mengelola perubahan kebutuhan
- Mahasiswa mampu mengevaluasi progress proyek
- Mahasiswa mampu mengendalikan proyek

POKOK BAHASAN

- Konsep Manajemen
 - Manajemen Proyek secara umum
 - Model Manajemen Klasik
 - Peran-peran dalam Manajemen Proyek
 - Struktur manajemen organisasional / enterprise
- Kerangka Kerja Manajemen Proyek PL
 - Kakas Bantu Manajemen Proyek PL
- Perencanaan Proyek
 - Perencanaan dan evaluasi
 - Work breakdown structure (WBS)
 - Penjadwalan task
 - Estimasi usaha (effort estimation), estimasi biaya
- Teknik estimasi biaya (cocomo, activity base costing, dll)
 - Alokasi sumber daya
 - Manajemen risiko
- Pembuatan proposal proyek
- Tender dan aspek legal proyek
 - Tender
- Mempersiapkan aspek legal dalam tender
- Dokumen kontrak
- Organisasi dan Personel Proyek
 - Struktur organisasi, posisi, tanggung jawab dan wewenang
 - Komunikasi formal dan informal
 - Project staffing
 - Pelatihan personil, pengembangan karir, dan evaluasi
 - Manajemen rapat (meeting management)
 - Membangun dan memotivasi tim
 - Conflict resolution
- Pengendalian Proyek
 - Pengendalian perubahan
 - Pelaporan dan monitoring
 - Analisis dan pengukuran hasil
 - recovery dan koreksi
 - penghargaan dan disiplin

- standar performans

PRASYARAT

Analisa dan Perancangan Sistem Informasi

PUSTAKA

- Schwalbe, Kathy, "Information Technology Project Management" 5th Edition, 2007
- Bob Hughes and Mike Cotterell: Software Project Management, 4th Edition, McGraw-Hill 2005
- Elaine Marmel: Microsoft Office Project 2003 Bible, Wiley Publishing Inc.
- Basics of Software Project Management, NIIT, Prentice-Hall India, 2004
- Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002
- Software Project Management, A Concise Study, S.A. Kelkar, Revised Edition, Prentice-Hall India, 2003

MATA KULIAH	Nama MK	: Pemrograman Berbasis Kerangka Kerja
	Kode MK	: IF184605
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa akan belajar konsep dasar desain kerangka kerja dan memanfaatkan kerangka kerja yang sudah tersedia. Mahasiswa diharapkan dapat memanfaatkan kerangka kerja pada sebuah proyek perangkat lunak dengan efektif dan efisien. Pemanfaatan kerangka kerja menyesuaikan dengan konteks proyek perangkat lunak yang sedang dikerjakan. Mahasiswa dapat mengidentifikasi kebutuhan kerangka kerja, batasan-batasan, keuntungan dan kerugian dari segi biaya dan waktu. Mahasiswa juga dapat merancang dan melakukan implementasi perangkat lunak yang mempertimbangkan kerangka kerja. Selain itu mahasiswa dapat memodifikasi/ menambahkan fungsionalitas pada kerangka kerja yang sudah ada agar sesuai dengan kebutuhan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan konsep dasar desain kerangka kerja.
- Mahasiswa mampu menjelaskan perbedaan pengembangan perangkat lunak secara tradisional dengan pengembangan perangkat lunak berbasis kerangka kerja.
- Mahasiswa mampu menjelaskan beberapa tipe kerangka kerja di domain yang berbeda-beda.
- Mahasiswa mampu mengidentifikasi keuntungan dan kerugian dalam penggunaan kerangka kerja.
- Mahasiswa mampu mengidentifikasi kerangka kerja yang sesuai dengan permasalahan dan/atau kebutuhan pengguna.

- Mahasiswa mampu mengidentifikasi batasan-batasan dalam pengembangan perangkat lunak berbasis kerangka kerja.
- Mahasiswa mampu mendesain rancangan perangkat lunak dengan mempertimbangkan kerangka kerja.
- Mahasiswa mampu mengimplementasikan perangkat lunak menggunakan beberapa kerangka kerja.
- Mahasiswa mampu menambahkan fungsionalitas baru pada suatu kerangka kerja (extension).

POKOK BAHASAN

- Konsep dasar kerangka kerja; metode pembuatan kerangka kerja; prinsip abstraksi; perbedaan pustaka (library) dan kerangka kerja.
- Prinsip DRY (don't repeat yourself); studi kasus sederhana pengembangan perangkat lunak tanpa kerangka kerja (fromscratch); studi kasus sederhana pengembangan perangkat lunak menggunakan kerangka kerja.
- Kerangka kerja pada platform web; kerangka kerja pada platform bergerak; kerangka kerja pada platform game; kerangka kerja pada platform desktop.
- Efek penggunaan kerangka kerja dari sisi kecepatan, jumlah kode yang harus dibuat, besaran waktu untuk memahami kerangka kerja yang harus diinvestasikan (learning curve), fleksibilitas yang berkurang, efek kerangka kerja pada performa perangkat lunak.

PRASYARAT

Pemrograman Berorientasi Objek

PUSTAKA

- Cwalina, K., Abrams, B., “Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries 2nd Edition”, Addison-Wesley, Boston, 2008.
- McConnell, S., “Code Complete: A Practical Handbook of Software Construction, 2nd Edition”, Microsoft Press, Redmond, 2004.

MATA KULIAH	Nama MK	: Teori Graf & Otomata
	Kode MK	: IF184604
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Dalam mata kuliah ini, mahasiswa akan belajar konsep graf, merepresentasikan graf dalam struktur data, memodelkan dan menyelesaikan beberapa kasus optimasi pada kehidupan sehari-hari ke dalam bentuk graf. Beberapa kasus optimasi yang dapat diselesaikan dengan teori graf antara lain: menentukan lintasan terpendek, pohon merentang minimum, menentukan rute minimum suatu perjalanan, penjadwalan, penugasan SDM, pencocokan dan optimasi aliran pada jaringan.

Mata kuliah ini bertujuan untuk memberikan bekal pengetahuan mengenai latar belakang perancangan bahasa pemrograman dan memberikan kemampuan memodelkan permasalahan nyata menggunakan otomata sebagai alat pemodelannya (dengan studi kasus bahasa pemrograman). Selain itu mahasiswa diharapkan dapat mengasah kemampuan mendefinisikan obyek atau himpunan tertentu dengan menggunakan definisi rekursif, baik secara mandiri atau juga dalam kerjasama tim.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mengimplementasikan representasi graf (struktur data non linear) secara statis (array) dan dinamis (linked-list dan STL) dengan bahasa pemrograman tertentu (misal C atau C++).
- Mahasiswa mampu menyelesaikan permasalahan dalam kehidupan sehari-hari yang dimungkinkan dapat dimodelkan dalam bentuk graf dengan memanfaatkan algoritma-algoritma yang berkaitan dengan teori graf
- Mahasiswa mampu mengaplikasikan konsep pendefinisian bahasa dan operasi-operasi matematis pendukungnya
- Mahasiswa mampu memahami pemodelan bahasa menggunakan Finite Automata dan mesin-mesin lain yang sejenis
- Mahasiswa mampu memahami perbedaan konsep Determinism dan Non Determinism serta mampu mengaplikasikan mesin-mesin pendukung keduanya
- Mahasiswa mampu memahami teknik pendefinisian, peran dan cara kerja Grammar pada bahasa pemrograman
- Mahasiswa mampu mengaplikasikan Teori Komputabilitas
- Mahasiswa mampu mengaplikasikan Teori Kompleksitas

POKOK BAHASAN

- Konsep-konsep tentang graf: Graph & Simple Graph, Subgraph, Vertex Degree, Path & Connection, Cycles, Isomorphism, Tree, Directed Graph, Cut Edge & Cut Vertex, Spanning Tree, Types of Digraph & Their Connections, Fundamental Cycle, Some Special Graphs.
- Representasi graf dalam struktur array, list, dan Standard Template Library (STL) pada bahasa pemrograman C/C++.
- Optimasi pada graf: Shortest path, Minimum Spanning tree, The Chinese Postman Problem, The Travelling Salesman Problem, dan Vehicle Routing Problem.
- Graf Planar: region, maximal planar graph, crossing number, bipartite graph, pewarnaan graf, dan bilangan kromatik.
- Teori dan aplikasi matching pada graf.
- Teori dan aplikasi Network pada graf.
- Bahasa dan Operasi-operasi Matematika Pendukungnya
 - Terminologi bahasa
 - Operasi-operasi pada bahasa
 - Metode pendefinisian bahasa
 - Regular Expression
 - Halting Problem (Pumping Lemma)
- Finite Automata
 - Deterministic Finite Automata (DFA)

- Transition Graph
- Automata with Output
- Teorema Kleene
- Non Determinism
 - Pengertian Non Determinism
 - Non Deterministic Finite Automata (N DFA)
 - Konversi DFA ke N DFA
 - Pushdown Automata (PDA)
- Grammar
 - Konsep Grammar
 - Derivasi dan Parse Tree
 - Klasifikasi Grammar
 - Context-Free Language(CFL)
 - Transformasi CFL
- Teori Komputabilitas
 - Mesin Turing
 - Mesin Turing untuk Non Deterministic
 - Mesin Church-Turing Thesis
 - Decidability
 - Reducibility
- Teori Kompleksitas
 - Kompleksitas waktu untuk NP-Complete
 - Kompleksitas ruang untuk NP-Complete

PRASYARAT

Matematika Diskrit

PUSTAKA

- Diestel, R., Graph Theory, 2000, Springer-Verlag
- Vasudev C, Graph Theory with Application, 2006, New Age International Publisher
- McHugh, J.A., Algorithmic Graph Theory, 1990, Prentice-Hall Inc.
- Liotta, G., Tamassia, R., Tollis, I., Graph Algorithms and Applications 2, 2004, World Scientific Pub.
- Introduction to the Theory of Computation , 3rd Edition, Cengage Learning, 2013
- Automata, Computability, and Complexity: Theory and Applications, Pearson International Edition, 2009

MATA KULIAH	Nama MK	: Interaksi Manusia dan Komputer
	Kode MK	: IF184601
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Mata kuliah Interaksi Manusia dan Komputer berfokus pada proses desain interaksi antara manusia dengan komputer dan pembangunan antar muka untuk melakukan interaksi. Interaksi antara manusia dengan komputer, berlangsung di dalam antar muka yang melibatkan perangkat lunak dan perangkat keras. Desain antar muka berdampak pada daur hidup suatu perangkat lunak. Desain dan implementasi fungsi-fungsi pokok dalam suatu perangkat lunak mempengaruhi antar muka pengguna. Mata kuliah ini melibatkan beberapa lintas disiplin ilmu seperti: psikologi, ergonomi, antropologi, ilmu komputer, desain grafis dan produk.

Melalui mata kuliah ini diharapkan mahasiswa mampu menerapkan prinsip-prinsip Interaksi Manusia dan Komputer (*Human-Computer Interaction*) pada pembuatan perangkat lunak serta melakukan evaluasi ketepatangunaan (*Usability Test*) perangkat lunak dan melaporkannya.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan computer;

Keterampilan Khusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrogram yang ada,

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mendiskusikan mengapa pengembangan perangkat lunak yang berpusat pada pengguna itu penting.
- Mahasiswa mampu memahami aturan/pedoman dasar dalam pengembangan perangkat lunak berikut desain interaksinya dengan mempertimbangkan aspek fisik, psikologi dan sosial pengguna.
- Mahasiswa mampu mengembangkan dan menggunakan konsep permodelan, umpan balik untuk menganalisa interaksi antara manusia dengan perangkat lunak.

- Mahasiswa mampu mendefinisikan proses desain yang berfokus pada pengguna yang secara eksplisit menempatkan pengguna bukan sebagai pembangun.
- Mahasiswa mampu membangun aplikasi sederhana beserta petunjuk penggunaan, serta dokumentasinya yang mendukung antar muka pengguna.
- Mahasiswa mampu membuat dan melakukan tes ketepatangunaan (Usability Test) pada perangkat lunak yang telah dikembangkan, melakukan evaluasi secara kuantitatif (utilitas, efisiensi, tingkat kemudahan penggunaan, dan tingkat kepuasan pengguna), dan melaporkannya.
- Mahasiswa mampu melaporkan dan mendiskusikan perkembangan teknologi interaksi natural (Natural User Interface) termutakhir: antarmuka sentuh (Multi-touch), antarmuka gerakan (Gesture), antarmuka gelombang otak (Electroencephalography), antarmuka gelombang otot (Electromyography).

POKOK BAHASAN

- Prinsip dasar tentang manusia, komputer, dan paradigma interaksi
- Prinsip dasar proses desain, permodelan, dan teori pada Interaksi Manusia dan Komputer (HCI)
- Proses pembangunan aplikasi yang berfokus pada pengguna
- Evaluasi-evaluasi pada perangkat lunak: utilitas, efisiensi, tingkat kemudahan penggunaan, dan tingkat kepuasan pengguna
- Kondisi fisik yang mempengaruhi desain antar muka: persepsi tentang warna, ergonomic
- Model kognitif yang mempengaruhi desain interaksi: perhatian, persepsi dan pengenalan, perpindahan, ingatan
- Model social yang mempengaruhi desain interaksi: budaya, komunikasi, jaringan, serta organisasi
- Prinsip-prinsip desain yang bagus dan pendesain yang bagus
- Antar muka untuk pengguna yang disable (buta, tuli, bisu), antar muka untuk pengguna dengan umur yang berbeda.
- Standar antar muka
- Petunjuk penggunaan dan dokumentasi perangkat lunak
- Prinsip prototipe kertas (Paper Prototyping)
- Prinsip desain antarmuka grafis (GUI)
- Pengkajian teknologi termutakhir pada antarmuka natural (Natural User Interface)

PRASYARAT

Pemrograman Berorientasi Objek

PUSTAKA

- Alan Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale. Human-Computer Interaction (3rd Edition). Prentice-Hall, Inc., Upper Saddle River, NJ, USA. 2003.
- Johnson, Jeff. Designing with the mind in mind: Simple guide to understanding user interface design rules. Morgan Kaufmann, 2010.
- Wigdor, Daniel, and Dennis Wixon. Brave NUI world: designing natural user interfaces for touch and gesture. Elsevier, 2011.
- Donald A. Norman. The Design of Everyday Things: Revised and Expanded Edition. Basic Books, 2013.

MATA KULIAH	Nama MK	: Pemrograman Jaringan
	Kode MK	: IF184602
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa belajar bagaimana membuat aplikasi yang bisa berkomunikasi dengan aplikasi lain pada jaringan komputer dengan menggunakan socket programming. Selain itu mahasiswa juga belajar cara komunikasi antar aplikasi.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu memahami konsep transmisi data pada aplikasi berbasis jaringan, dengan berbagai metode transmisi yang ada, seperti TCP dan UDP, Unicast, Broadcast, dan Multicast. Selain itu juga mampu mengaplikasikan

pada protokol yang ada dan mendesain protokol komunikasi untuk aplikasi berbasis jaringan.

POKOK BAHASAN

- Teknik Socket Programming: TCP socket, UDP socket, pengolahan string, socket option, TLS/SSL.
- Protokol Layer Aplikasi: HTTP, SMTP, IMAP, POP, FTP
- Mekanisme Input/Output: I/O Model, Blocking I/O, Non-Blocking I/O, Signal Driven I/O, I/O Multiplexing, Asynchronous I/O.
- Pengiriman Data: Unicast, Broadcast, Multicast.

PRASYARAT

Jaringan Komputer

PUSTAKA

- W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, "Unix Network Programming Vol.1 3rd Edition", Addison Wesley, 2003.
- Nathan Yocom, John Turner, Keir Davis, "The Definitive Guide to Linux Network Programming", Appress, 2004. Pustaka
- Elliotte Rusty Harold, "Java Network Programming 3rd Edition", O'Reilly Media, 2004.
- Brandon Rhodes, John Goerzen, "Foundations of Python Network Programming", Appress, 2013.

MATA KULIAH	Nama MK	: Rekayasa Kebutuhan
	Kode MK	: IF184603
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai teknik-teknik untuk mengamankan informasi yang ada di dalam komputer dan membuat program yang aman.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menentukan pendekatan, metode, kerangka kerja, dan kakas Bantu yang dapat menyelesaikan suatu permasalahan nyata tertentu.
- Mahasiswa mampu menspesifikasi kebutuhan perangkat lunak

POKOK BAHASAN

- KONSEP DAN PRINSIP REKAYASA KEBUTUHAN PERANGKAT LUNAK: konsep rekayasa kebutuhan, kebutuhan fungsional/non fungsional, jenis pemangku kepentingan,
- ELISITASI: metode pengumpulan kebutuhan tradisional observasi, kognitif, kolaboratif, kontekstual, dan etnografi; skenario, prioritas kebutuhan, penilaian kebutuhan
- PEMODELAN: pemodelan proses, pemodelan data

- SPESIFIKASI: spesifik, measureable, realizable, attainable, dan trackable/time-bound
- VERIFIKASI DAN VALIDASI SPESIFIKASI KEBUTUHAN: evolusi kebutuhan, manajemen perubahan, kriteria validasi dan verifikasi kebutuhan, teknik verifikasi.

PRASYARAT

Analisa dan Perancangan Sistem Informasi

PUSTAKA

Daniel Siahaan, “Rekayasa Kebutuhan,” Penerbit Andi, 2012.

MATA KULIAH	Nama MK	: Keamanan Informasi dan Jaringan
	Kode MK	: IF184701
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai teknik-teknik untuk mengamankan informasi yang ada di dalam komputer dan membuat program yang aman.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu memahami konsep keamanan informasi, baik yang terdapat pada suatu komputer maupun yang sedang ditransmisikan pada suatu jaringan. Berdasarkan konsep-konsep tersebut, mahasiswa mampu mengaplikasikannya, baik secara individu maupun secara berkelompok dalam tim

POKOK BAHASAN

- Konsep Dasar Keamanan: security property (confidentiality, integrity, availability, dll)
- Dasar Algoritma Enkripsi: teori bilangan.
- Jenis-Jenis Algoritma Enkripsi: enkripsi klasik, blok, stream, simetrik, asimetrik.
- Integritas Data : Hash function, Message Authentication Code, Digital Signature, Digital Certificate, Public Key Infrastructure
- Keamanan Pada Program Komputer: kelemahan string, buffer overflow, SQL injection, manajemen memori dinamik, dll.

PRASYARAT

Jaringan Komputer

PUSTAKA

- Cryptography and Network Security: Principles and Practice (6th Edition) by William Stallings (Mar 16, 2013).

- Secure Coding in C and C++ (2nd Edition) (SEI Series in Software Engineering) by Robert C. Seacord (Apr 12, 2013).

MATA KULIAH	Nama MK	: Pengembangan dan Analisis Algoritma
	Kode MK	: IF184402
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa akan belajar melakukan abstraksi optimal dari permasalahan nyata dengan tingkat kompleksitas menengah dan lanjut. Mahasiswa diharapkan juga mampu mewujudkan abstraksi tersebut ke dalam suatu rancangan algoritma dengan mempertimbangkan aspek kebenaran dan efisiensi secara formal. Pada akhirnya mahasiswa mampu mempresentasikan keseluruhan tahapan rancangan dan analisis algoritma secara sistematis baik secara lisan maupun secara tulisan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu secara kreatif membuat abstraksi optimal dari persoalan nyata dengan tingkat kompleksitas medium dan hard.
- Mahasiswa mampu mewujudkan abstraksi persoalan ke dalam suatu rancangan algoritma dengan mempertimbangkan aspek kebenaran dan efisiensi
- Mahasiswa mampu menyatakan analisis kebenaran dan kompleksitas secara formal terhadap suatu rancangan algoritma
- Mahasiswa dapat mengimplementasikan hasil rancangan algoritma dengan menggunakan bahasa OOP dan menguji akurasi pada suatu online judge

- Mahasiswa mampu mempresentasikan keseluruhan tahapan rancangan dan analisis algoritma secara sistematis baik secara lisan maupun tulisan

POKOK BAHASAN

- Algoritma dan kompleksitas
- Rancangan dan analisis algoritma yang memiliki paradigma divide and conquer
 - Algoritma binary search
 - Pemrograman dinamis jenis non classical
 - Algoritma greedy
- Representasi beberapa struktur data lanjut yang berhubungan dengan dynamic programming
 - Struktur segmen tree (range min/max query, range sum query) serta teknik lazy propagation
 - Fenwick Tree (binary indexed tree)
 - Splay tree
- Rancangan dan analisis algoritma pada struktur graph
 - Minimum spanning tree
 - All pair shortest path dan single source shortest path
 - Strongly connected component, topological sort dan 2-SAT problem
 - Maximum flow, minimum cut, dan bipartite matching
- Rancangan dan analisis algoritma problem string matching
 - KMP, Boyer Moore
 - Struktur data trie
- Struktur data suffix array, suffix tree dan suffix trie

PRASYARAT

Perancangan dan Analisis Algoritma

PUSTAKA

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms Third Edition", MIT Press, 2009
- Levitin, Anany, "Introduction to The Design & Analysis Af algorithms 3rd ed", Addison-Wesley, 2012
- Robert Sedgewick, Kevin Wayne, Algorithms, 4th Edition, Addison Wesley, 2011
- Stephen Halim, Felix Halim, Competitive Programming, 3rd Edition, NUS School of Computing, 2013

MATA KULIAH	Nama MK	: Riset Operasi
	Kode MK	: IF184923
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa belajar memodelkan persoalan yang ada di dunia nyata ke dalam pemodelan Program Linier (PL). Mahasiswa akan mempelajari materi PL dengan 2 variabel, mempelajari solusi PL dengan menggunakan grafik, Solusi PL dengan menggunakan Excel Solver dan TORA. Metode Simplex diawali dengan bentuk persamaan Model PL kemudian Transisi dari grafik ke solusi aljabar, untuk persoalan yang lebih kompleks menggunakan M-method dan metoda dua fasedan dilanjutkan dengan Analisa Sensitivitas. Duality diawali dengan definisi dual problem, kemudian hubungan antara primal dan dual, dilanjutkan dengan interpretasi ekonomi dari duality, algoritma simplex additional dan analisa post-optimal. Model transportasi diawali dengan definisi dari model transportasi, model transportasi nontradisional, algoritma transportasi dan model penugasan. Model Jaringan diawali dengan skope dan definisi dari model jaringan, algoritma minimal spanning tree, problem rute terpendek, model maximal flow, CPM dan PERT. Pemrograman Linier Integer diawali dengan ilustrasi contoh aplikasi, algoritma integer programming dan traveling salesmen. Untuk tiap-tiap sub bahasan akan diimplementasikan ke dalam program.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada,

serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;
CAPAIAN PEMBELAJARAN MATA KULIAH
• Mahasiswa mampu menyelesaikan masalah Pemodelan Program Linier. • Mahasiswa mampu menyelesaikan masalah Program linier dengan menggunakan metoda simplex. • Mahasiswa mampu melakukan analisa sensitivitas pada program linier. • Mahasiswa mampu menyelesaikan masalah duality. • Mahasiswa mampu menyelesaikan masalah transportasi. • Mahasiswa mampu menyelesaikan masalah jaringan. • Mahasiswa mampu menyelesaikan masalah pemrograman integer. • Mahasiswa mampu mengimplementasikan masalah tersebut diatas ke dalam program
POKOK BAHASAN
Pemodelan Program Linier; Model PL dengan 2 variabel, Solusi PL dengan menggunakan grafik, Solusi PL dengan menggunakan Excel Solver dan TORA. Metode Simplex dan Analisa Sensitivitas; Bentuk persamaan Model PL, Transisi dari grafik ke solusi aljabar, Metode Simplex, M-method dan metoda dua fase, Kasus khusus pada metode Simplex, Analisa Sensitivitas. Duality dan analisa post-optimal; definisi dual problem, hubungan antara primal dan dual, interpretasi ekonomi dari duality, algoritma simplex additional, analisa post-optimal. Model transportasi dan variannya; Definisi dari model transportasi, model transportasi nontradisional, algoritma transportasi, model penugasan. Model Jaringan; skope dan definisi dari model jaringan, algoritma minimal spanning tree, problem rute terpendek, model maximal flow, CPM dan PERT. Pemrograman Linier Integer; ilustrasi contoh aplikasi, algoritma integer programming, traveling salesmen
PRASYARAT
Aljabar Linier
PUSTAKA
Operation Research ; Hamdy A. Taha, University of Arkansas, Prentice Hall; eight edition, 200

MATA KULIAH	Nama MK	: Teknik Pengembangan Game
	Kode MK	: IF184931
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mata kuliah ini bertujuan agar mahasiswa mampu membuat sebuah game komputer berdasarkan teori-teori pendukung dasar pengembangan game. Pada awal mata kuliah ini mahasiswa akan mempelajari tentang sejarah pengembangan dan teknologi game, mengenal berbagai game populer yang ada serta klasifikasi berdasarkan genre dan klasifikasi lainnya. Tahap selanjutnya akan mempelajari bagaimana proses pengembangan game, bagaimana merancang desain game, membuat dokumentasi game (GDD), kemudian meningkatkan kualitas fun game dengan theory of fun, atau menambahkan edukasi dalam game. Hingga ada akhir kuliah mahasiswa bersama tim akan mampu mengimplementasikan pembuatan game.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan computer;

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mengklasifikasikan game berdasarkan genre, tema dan rating.
- Mahasiswa mampu membuat dokumen desain game (Game Design Document)
- Mahasiswa mampu membentuk tim untuk pengembangan game serta membuat game yang memuat unsur-unsur dasar dengan atau tanpa bantuan middleware

POKOK BAHASAN

Teori dasar pengembangan game, proses pengembangan game, Game Design Document (GDD), game middleware, game edukasi, theory of fun.

PRASYARAT

Interaksi Manusia dan Komputer

PUSTAKA
Arnest Adam, "Fundamentals of Game Design", New Riders Press, 2nd Edition 2010

MATA KULIAH	Nama MK	: Jaringan Multimedia
	Kode MK	: IF184941
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Mata kuliah ini bertujuan supaya mahasiswa mampu menerapkan konsep & prosedur dalam pengiriman data multimedia (teks, citra, suara, dan video) dalam jaringan secara optimal dan aman baik secara individu maupun secara berkelompok dalam kerjasama tim. Materi yang dibahas meliputi dasar-dasarmultimedia beserta representasinya, cara kompresi data multimedia supaya cukup kecil untuk didistribusikan melalui jaringan, dan mengamankan data multimedia yang dikirimkan melalui jaringan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menerapkan konsep & prosedur dalam pengiriman data multimedia (teks, citra, suara, dan video) dalam jaringan secara optimal dan aman baik secara individu maupun secara berkelompok dalam kerjasama tim.

POKOK BAHASAN

- Dasar Multimedia: Data teks, citra, audio, video
- Representasi dan Kompresi Data Multimedia
- Jaringan Multimedia
- Distribusi Multimedia
- Keamanan Multimedia

PRASYARAT

Jaringan Komputer

PUSTAKA

- Henning Titi Ciptaningtyas, "Bahan Ajar Jaringan Multimedia", <http://share.its.ac.id>, 2013, IF-ITS.
- Jeniq-Neng Hwang, "Multimedia Networking From Theory to Practice", Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, "Fundamentals of Multimedia", Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy, "QoS Measurement and Evaluation of Telecommunications Quality of Service", Wiley, 2001. ISBN 0470845910.

MATA KULIAH	Nama MK	: Pengolahan Citra Digital
	Kode MK	: IF184952
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa belajar tentang konsep persepsi visual, citra digital keabuan dan citra berwarna serta citra biner, teknik perbaikan dan restorasi citra, transformasi diskrit Fourier dan wavelet, transformasi Hough, zooming. Selanjutnya mahasiswa mempelajari proses segmentasi, metode ekstraksi fitur sebagai deskriptor citra, metode morfologi, pencocokan templet, encoding dan decoding. Mahasiswa menerapkan teknik-teknik yang dipelajari dalam tugas proyek baik secara individu maupun berkelompok.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalan data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang.

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan persepsi visual dan definisi citra digital.
- Mahasiswa mampu menjelaskan perbaikan citra untuk meningkatkan kontras atau untuk melakukan pemfilteran dengan berbagai metode dalam domain spasial.
- Mahasiswa mampu menjelaskan transformasi dan pemfilteran citra dalam domain frekuensi, wavelet, dan transformasi Hough.
- Mahasiswa mampu menjelaskan dasar-dasar warna, pengolahan citra berwarna, dan pseudo color.
- Mahasiswa mampu menjelaskan proses restorasi citra untuk memperbaiki citra yang terdegradasi secara visual atau registrasi citra secara geometris dan proses zooming.

- Mahasiswa mampu menerapkan pengolahan citra digital untuk visualisasi dan menganalisa hasilnya.
- Mahasiswa mampu menjelaskan metode segmentasi dengan berbagai metode, baik yang berbasis batas tepi, nilai batas ambang, dan daerah.
- Mahasiswa mampu menjelaskan konsep representasi dan deskripsi serta metode ekstraksi fitur sebagai deskriptor citra, serta metode pencocokan templet.
- Mahasiswa mampu menjelaskan metode morfologi untuk pengolahan citra terutama citra biner.
- Mahasiswa mampu menjelaskan proses encoding dan decoding citra serta dasar kompresi citra.
- Mahasiswa mampu menerapkan pengolahan citra digital untuk segmentasi dan deskripsi fitur serta menganalisa hasilnya

POKOK BAHASAN

- Perbaikan Citra (Enhancement) DOMAIN SPASIAL: transformasi kurva, Histogram, ekualisasi histogram, Konvolusi, filter median
- TRANSFORMASI CITRA: transformasi Fourier, wavelet, transformasi Hough.
- Perbaikan Citra (Enhancement) DOMAIN FREKUENSI: Ideal LPF, Butterworth LPF, Gaussian LPF (GLPF), IHPF, BHPF, GHPF
- CITRA BERWARNA: dasar-dasar warna, pengolahan citra berwarna, dan pseudo color.
- RESTORASI CITRA, WARPING, ZOOMING: filter Inverse, filter Wiener, registrasi, warping, zooming.
- SEGMENTASI: deteksi garis/tepi, thresholding, segmentasi berbasis region.
- REPRESENTASI DAN DESKRIPSI: kode rantai, pendekatan poligon, signature, segmen boundary, skeletoning, thinning.
- DESKRIPTOR: boundary descriptor, Fourier descriptor, topological descriptor, momen, tekstur, korelasi
- METODE MORFOLOGI: citra biner, konektivitas, dilasi, erosi, rekonstruksi morfologi, pencocokan templet, boundary extraction, thinning.
- ENCODING/DECODING: run-length encoding, Huffman code, JPEG, transformasi DCT, kuantisasi, urutan zig-zag.

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

- Gonzales, R.C., and Woods, R. E., “Digital Image Processing”, Prentice Hall, 2008

- Pratt, W.K., "Digital Image Processing", John Wiley & Sons, Inc., 2007
- Forsyth, David A., and Ponce, Jean, "Computer Vision: A Modern Approach", 2nd Ed., Pearson Education, Inc., 2012
- Petrou, Maria, and Petrou, Costas, "Image Processing: The Fundamentals", John Wiley & Sons Ltd, 2010
- Costaridou, Lena (Ed.), "Medical Image Analysis Methods", Taylor & Francis Group, 2005
- Russ, John C., "The Image Processing Handbook", fifth edition, CRC Press, 2007

MATA KULIAH	Nama MK	: Sistem Enterprise
	Kode MK	: IF184961
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mata kuliah ini membahas proses bisnis dan sistem informasi enterprise. Mahasiswa diharapkan memiliki kompetensi dalam analisis, sintesis, evaluasi dan inovasi sistem enterprise yang sesuai kebutuhan proses bisnis. Berbagai sistem akan dibahas, antara lain Sistem Akuntansi (financial accounting, management accounting, cost accounting). Customer Relationship Management (CRM), Supplier Relationship Management (SRM), dan Enterprise Resource Planning (ERP).

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan proses bisnis dan sistem informasi pada sistem enterprise (SE)
- Mahasiswa mampu menganalisis, mensintesis dan mengevaluasi proses bisnis SE
- Mahasiswa mampu menjelaskan, menganalisis, mensintesis dan mengevaluasi Service Oriented Architecture
- Mahasiswa mampu menjelaskan, menganalisis, mensintesis dan mengevaluasi pemodelan proses bisnis
- Mahasiswa mampu menjelaskan, menganalisis, mensintesis dan mengevaluasi scalable dan reconfigurable proses bisnis SE

POKOK BAHASAN

Sistem informasi tentang arsitektur informasi enterprise, arsitektur aplikasi enterprise. Business process management meliputi proses bisnis, pemodelan proses bisnis, komposisi proses bisnis. Service oriented architecture (SOA) membahas arsitektur service enterprise, komposisi web services, enterprise service bus (ESB)

PRASYARAT

Sistem Basis Data

PUSTAKA

- Simha R. Magal, Integrated Business Processes with ERP Systems, John Wiley & Sons, Inc., 2012
- Riyanarto Sarno, ANALISIS DAN DESAIN BERORIENTASI SERVIS UNTUK APLIKASI MANAJEMEN PROYEK, Andi Publisher, 2012, ISBN 978-979-29-3072-6.
- Manfred Reichert, Barbara We, Enabling Flexibility in Process-Aware Information Systems, Challenges, Methods, Technologies. Springer-Verlag, Berlin Heidelberg, 2012.
- Riyanarto Sarno, STRATEGI SUKSES BISNIS DENGAN TI Berbasis Balanced Scorecard dan COBIT, ITS Press, 2009, ISBN 978-979-8897-42-9.
- Riyanarto Sarno, et al. (2013). Petri Net Model of ERP Business Process Variations for Small and Medium Enterprises, Journal of Theoretical and Applied Information Technology, 10th August 2013. Vol. 54 No.1, pp.31-38.
- Riyanarto Sarno, Yeni Anistyasari dan Rahimi Fitri, SEMANTIC SEARCH, Andi Publisher, 2012, ISBN 978-979-29-3110-5.

MATA KULIAH	Nama MK	: Arsitektur Perangkat Lunak
	Kode MK	: IF184971
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa melakukan desain struktur sebuah sistem perangkat lunak berdasarkan spesifikasi kebutuhan atau studi kasus yang diberikan. Disiplin ilmu yang dipelajari adalah menentukan struktur tingkat tinggi (high-level) dan membagi-bagi menjadi komponen-komponen, ketergantungan dan konektivitasnya berdasarkan karakteristik sistem perangkat lunak yang dibuat. Dalam mengembangkan desain arsitektur, mahasiswa dapat memanfaatkan pola-pola perancangan yang sudah ada. Mahasiswa juga dituntut untuk dapat mendokumentasikan desain arsitekturnya dan menggunakannya sebagai alat komunikasi kepada pengembang dan stakeholder lain.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model

pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai.
CAPAIAN PEMBELAJARAN MATA KULIAH • Mahasiswa mampu menjelaskan berbagai arsitektur perangkat lunak untuk berbagai jenis sistem perangkat lunak. • Mahasiswa mampu memilih arsitektur yang tepat berdasarkan karakteristik sistem perangkat lunak. • Mahasiswa mampu menjabarkan arsitektur perangkat lunak dalam level dan detil yang bertingkat. • Mahasiswa mampu melakukan dekomposisi arsitektur tingkat tinggi (high-level) menjadi komponen-komponen dan menentukan ketergantungan dan koneksi antar komponen. • Mahasiswa mampu mengidentifikasi pola-pola perancangan yang tepat berdasarkan permasalahan dalam desain arsitektur perangkat lunak. • Mahasiswa mampu mengimplementasi pola-pola perancangan ke dalam desain arsitektur dan kode program
POKOK BAHASAN • Berbagai macam tipe perangkat lunak. • Berbagai macam jenis arsitektur perangkat lunak (monolithic, client-server, two-tier, three-tier, model-view-controller, dll). • Prinsip-prinsip dalam perancangan arsitektur perangkat lunak. • Konsep layering dan ketergantungan antar komponen. • Notasi-notasi diagram dalam arsitektur perangkat lunak. • Berbagai tingkatan view dalam arsitektur perangkat lunak (logical view, process view, development view, dan physical view). • Pola-pola perancangan (creational patterns, structural patterns, dan behavioral patterns). • Pola-pola perancangan dalam aplikasi enterprise atau aplikasi jaringan, dll (opsional). • The issue of research in distributed systems (load balancing, load estimation, load migration, and big data)
PRASYARAT
Analisa dan Perancangan Sistem Informasi
PUSTAKA • Gamma, Erich. Design Patterns: Elements of Reusable Object-oriented Software. Reading, Mass.: Addison-Wesley, 1995. • Fowler, Martin. Patterns of Enterprise Application Architecture. Boston: Addison-Wesley, 2003.

MATA KULIAH	Nama MK	: Penjaminan Mutu Perangkat Lunak
	Kode MK	: IF184972
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Tujuan mata kuliah ini adalah untuk memberikan pengetahuan kepada mahasiswa tentang konsep dasar dan teknik pengujian perangkat lunak yang mutakhir. Selain itu, diberikan juga aspek-aspek penting lainnya yang berhubungan dengan kualitas perangkat lunak, yaitu termasuk: aspek dokumentasi, keamanan, toleransi kesalahan, penilaian keandalan, dan lain-lain. Pada beberapa bahasan, diberikan juga studi kasus agar mahasiswa dapat mengaplikasikan teori, konsep, dan teknik tertentu pada kasus yang diberikan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mampu memahami dasar-dasar pengujian perangkat lunak.
- Mampu menjelaskan dengan rinci, membedakan, dan melakukan jenis dan tingkatan pengujian (unit, integrasi, sistem, penerimaan).
- Mampu menjelaskan dan melakukan teknik-teknik pengujian.
- Mampu menjelaskan dengan rinci teknik-teknik identifikasi kasus-kasus uji yang penting untuk pengujian unit, integrasi, dan sistem.

- Mampu menerapkan proses inspeksi atau review terhadap kode sumber perangkat lunak pada proyek perangkat lunak skala kecil atau menengah.
- Mampu berpartisipasi aktif sebagai bagian dari aktivitas tim untuk mempraktikkan proses inspeksi terhadap segmen kode sumber skala kecil/medium.
- Mampu melakukan pengukuran yang berkaitan dengan pengujian.
- Mampu melakukan proses/prosedur pengujian.
- Mampu menjelaskan dengan baik proses verifikasi dan validasi pada artifak yang bukan kode sumber.
- Mampu menggunakan kakas bantu pengujian dalam pelaksanaan proses pengujian.
- Mampu menggunakan dengan baik kakas bantu pelacakan cacat perangkat lunak untuk mengelola cacat perangkat lunak pada proyek perangkat lunak skala kecil, dan menganalisis hasilnya.
- Mampu memahami dasar-dasar penjaminan mutu perangkat lunak.

POKOK BAHASAN

- Dasar-dasar pengujian perangkat lunak
 - Terminologi yang berkaitan dengan pengujian
 - Isu-isu utama
 - Keterkaitan pengujian dengan aktivitas lain
- Tingkatan-tingkatan pengujian
 - Target pengujian
 - Tujuan pengujian
- Teknik pengujian.
 - Teknik pengujian berbasis intuisi dan pengalaman
 - Teknik pengujian berbasis domain masukan
 - Teknik pengujian berbasis kode
 - Teknik pengujian berbasis kegagalan (*fault*)
 - Teknik pengujian berbasis penggunaan
 - Teknik pengujian berbasis model
 - Teknik pengujian berbasis katakteristik aplikasi
- Pengukuran yang berkaitan dengan pengujian
 - Evaluasi terhadap program yang sedang diuji
 - Evaluasi terhadap pengujian yang telah selesai dilakukan
- Proses pengujian
 - Pertimbangan-pertimbangan praktis
 - Aktivitas pengujian
- Kakas bantu pengujian
 - Dukungan kakas bantu
 - Kategori kakas bantu

- Dasar-dasar kualitas perangkat lunak
 - Etika dan kultur perangkat lunak
 - Nilai dan biaya kualitas perangkat lunak
 - Karakteristik-karakteristik model dan kualitas perangkat lunak
 - Penyempurnaan kualitas perangkat lunak
 - Aspek yang berhubungan dengan keamanan perangkat lunak (*safety*)

PRASYARAT

Analisa dan Perancangan Sistem Informasi

PUSTAKA

- S. Naik and P. Tripathy, Software Testing and Quality Assurance: Theory and Practice, Wiley-Spektrum, 2008.
- S.H. Kan, Metrics and Models in Software Quality Engineering, 2nd ed., Addison-Wesley, 2002.
- D. Galin, Software Quality Assurance: From Theory to Implementation, Pearson Education Limited, 2004.

MATA KULIAH	Nama MK	: Jaringan Nirkabel
	Kode MK	: IF184911
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai cara komunikasi antar komputer. Bagaimana data bisa terkirim dari satu komputer ke komputer lain berdasarkan konsep OSI Layer

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menerapkan konsep pada beragam arsitektur jaringan nirkabel untuk meningkatkan performa dan memberikan penyelesaian pada permasalahan jaringan nirkabel.

POKOK BAHASAN

- **PENGENALAN WIRELESS LAN & JARINGAN SELULER:** Perkembangan Wireless LAN, Aplikasi pada Wireless LAN, GPRS, 3G, 4G, LTE
- **ANTENA & PENYEBARAN SPEKTRUM:** Karakteristik Frekuensi Radio, Konsep Dasar Antena, Tipe Antena, Pengenalan Penyebaran Spektrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Membandingkan FHSS dan DSSS

- INFRASTRUKTUR PERANGKAT WIRELESS LAN: Access Point, Wireless Bridge, Wireless Workgroup Bridge, Perangkat Klien Wireless LAN, Wireless Residential Gateway, Enterprise Wireless Gateway
- STANDAR WIRELESS LAN: IEEE 802.11, IEEE 802.16, HomeRF, Bluetooth, IrDA, WLLF
- ARSITEKTUR JARINGAN 802.11: Menemukan Wireless LAN, Autentikasi dan Asosiasi, Service Sets, Fitur Manajemen Daya
- MAC & LAPISAN FISIK: Komunikasi dalam Wireless LAN, Interframe Spacing, CSMA/CA, Request to Send/Clear to Send (RTS/CTS), Modulasi
- ARSITEKTUR TROUBLESHOOTING WIRELESS LAN: Multipath, Hidden Node, Near/Far, System Throughput, Interference, Range
- KEAMANAN WIRELESS LAN: Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), Serangan pada WIRELESS LAN, Solusi Pengamanan, Aturan Pengamanan, Rekomendasi Pengamanan
- OVERVIEW MANET, WIRELESS SENSOR NETWORK, Standar UMTS
- JARINGAN AD-HOC & ROUTING: Wireless TCP/IP, Konsep Dasar Jaringan Ad-Hoc, Ad-Hoc Routing (Dynamic Source Routing-DSR, Ad hoc On-Demand Distance Vector-AODV)
- MOBILE IP: Konsep Mobile IP, Hirarki Mobile IP, Fast Handovers pada Mobile IP
- MOBILE TRANSPORT LAYER: Permasalahan dengan TCP pada Jaringan Nirkabel, Perbaikan: Indirect TCP, Snoop TCP, Mobile TCP, TCP over 3G

PRASYARAT

Jaringan Komputer

PUSTAKA

- 1. Coleman, D., Westcott, D., "CWNA: Certified Wireless Network Administrator Official Study Guide", Wiley Publishing Inc., 2009.
- 2. Schiller, J.H., "Mobile Communications 2nd Edition", Addison-Wesley, 2004.
- 3. Stallings, W., "Wireless Communications and Networking 2nd Edition", Prentice Hall, 2004.
- James F. Kurose and Keith W. Ross, Komputer Networking: A Top-Down Approach, 7th Edition, Addison Wesley, 2013.

MATA KULIAH	Nama MK	: Teknologi Antar Jaringan
	Kode MK	: IF184912
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai cara komunikasi antar komputer. Bagaimana data bisa terkirim dari satu komputer ke komputer lain berdasarkan konsep OSI Layer

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

KeterampilanKhusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mengimplementasikan static routing pada jaringan komputer
- Mahasiswa mampu mengimplementasikan dynamic routing pada jaringan komputer

POKOK BAHASAN

Pengantar Teknologi Antar Jaringan: Pengertian maksud & tujuan perkuliahan Teknologi Antar Jaringan, Rancangan Pembelajaran, Komponen & Bentuk Evaluasi, Subnetting & Static Routing: IP, CIDR, VLSM, NAT, Static Routing, CISCO IOS, Switching Layer 2 : Switching service, Spanning Tree Protocol, LAN Switch, Macam-Macam Dynamic Routing: Distance Vector Routing, Link State Routing, Virtual LAN : VLAN, VLAN Trunking Protocol, VLAN Routing, Konfigurasi, Virtual Private Network : VPN, Konfigurasi, Routing Information Protocol : RIPv1, RIPv2, Interior Gateway Routing Protocol:

Timer IGRP, Konfigurasi, Enhanced IGRP : Fitur, Neighbour Discovery, RTP, DUAL, AS, OSPF & IS-IS : Algoritma, Konfigurasi, IP Traffic Engineering : Traffic, Network Flow Optimization, Shortest Path Routing & Network Flow, MCNF Duality, Border Gateway Protocol : Algoritma, Message Format, Operations, Konfigurasi, Internet Routing Architecture: Illustration, Architectural View of Internet, Allocation of IP Prefixes and AS Number, Quality of Service Routing : QOS Attributes, Shortest Path & Widest Path Routing, Source-based QOS Routing, QOSPF, IPv6 : Terminologi, Packet Format, Perbedaan dg IPv4, Tunneling IPv4

PRASYARAT

Jaringan Komputer

PUSTAKA

- Todd Lammle, CCNA Study Guide, Third Edition, 2002
- Deepankan Medhi, Karthikeyan Ramasamy, Network Routing Algorithms, Protocols, and Architectures, 2007

MATA KULIAH	Nama MK	: Pemrograman Perangkat Bergerak
	Kode MK	: IF184901
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mahasiswa belajar mengenai pembuatan aplikasi berbasis mobile

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;
- Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan computer;

Keterampilan Khusus:

- Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;
- Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa memiliki sebuah pemahaman tentang pemrograman perangkat mobile, mampu mengimplementasi berbagai macam platform pada Perangkat mobile, mampu memakai JavaScript, AJAX pada perangkat mobile dan memakai template standar, mampu membuat halaman mobile web pada browser smartphone, mampu memakai teknik-teknik penghematan bandwidth, mampu memakai teknik-teknik penghematan bandwidth.

POKOK BAHASAN
Pengenalan pengembangan Mobile Web Development,Mengkonfigurasi lingkungan Mobile Web Development , Lebih lanjut dengan Mobile Markup Languages, WML , Pengelolaan Content ,Penambahan fitur interaksi dengan memakai JavaScript dan AJAX , Mobile Web Usability , Meningkatkan kemampuan halaman Mobile Web pada browser Smartphone , Penghematan bandwidth pada Mobile web , Validasi pada Mobile Web.
PRASYARAT
Pemrograman Berorientasi Objek
PUSTAKA
• Beginning Smartphone Web Development , Gail Rahn Frederick with Rajesh Lal, Appress, 2009 • Hello, Android, Introducing Google's, Mobile Development Platform, 2nd Edition, Ed Burnette, The Pragmatic Bookshelf, Raleigh, North Carolina Dallas, Texas, 2009

MATA KULIAH	Nama MK	: Pemodelan dan Simulasi
	Kode MK	: IF184921
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar Konsep Pemodelan dan simulasi, Hubungan pemodelan dan simulasi, Distribusi probabilitas dan visualisasi dalam pemodelan dan simulasi, Pemodelan input, Analisis output, Pembuatan model simulasi dengan kaskas simulasi

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrogram yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menerapkan konsep & prosedur dalam pembuatan model simulasi dari suatu sistem nyata yang dipelajari efisiensi kinerjanya,

mengeksekusi model simulasi, membuat mengambil kesimpulan tentang kinerja berdasarkan analisis terhadap luaran simulasi, mengembangkan sistem alternatif serta membandingkan kinerja berdasarkan luaran simulasi sistem nyata dan sistem alternatif tersebut, baik dengan bekerja secara individu maupun secara berkelompok dalam kerjasama tim

POKOK BAHASAN

- Konsep Pemodelan dan simulasi
- Hubungan pemodelan dan simulasi
- Distribusi probabilitas dan visualisasi dalam pemodelan dan simulasi
- Pemodelan input
- Analisis output
- Pembuatan model simulasi dengan kaskas simulasi

PRASYARAT

Probabilitas dan Statistik

PUSTAKA

- Banks, J., John S. Carson II, "Discrete-Event System Simulation", Prentice Hall, 2009.
- Law, A., "Simulation Modeling and Analysis", McGraw-Hill, 2006.

MATA KULIAH	Nama MK	: Realitas Virtual danAugmentasi
	Kode MK	: IF184932
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Realitas Virtual mempelajari aspek aspek yang terkait dengan pengembangan *virtual reality*, *augmented reality*, dan *mixed reality*. Mata kuliah ini bertujuan agar mahasiswa memahami elemen input dan output yang ada di dalam realitas virtual dan pemodelan optis untuk menghasilkan tampilan stereoscopic, membuat pemodelan dan pemograman di dalam realitas virtual serta aplikasi realitas virtual 3 dimensi dengan menggunakan *game engine*.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan computer

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami teori Virtual Reality (VR) dan Augmented Reality (AR) secara menyeluruh: perangkat lunak dan keras.
- Mahasiswa mampu merancang dan membangun lingkungan virtual dasar, menerapkan cara interaksi yang baik, dan melakukan pemodelan.
- Mahasiswa mampu membuat aplikasi VR dan AR 3 dimensi.

POKOK BAHASAN

Komputasi dalam game, game simulasi, game multi pemain, game sosial, game economy

PRASYARAT

Interaksi Manusia dan Komputer.

PUSTAKA

- Grigore, C Burdea & Philippe, Coiffet, “Virtual Reality Technology”, Wilye Interscience, 2003.

- William R. Sherman, Alan B. Craig, “Understanding Virtual Reality”, Morgan-Kaufmann, Inc., 2003.

MATA KULIAH	Nama MK	: Sistem Game
	Kode MK	: IF184933
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa mempelajari berbagai aspek yang diperlukan dalam membangun game yang kompleks. Mahasiswa akan mempelajari serious game, game simulasi, komputasi dalam game, jaringan untuk game, game multi pemain, social game dan game economy.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan berbagai aspek untuk membangun game yang kompleks.
- Mahasiswa mampu menjelaskan aspek komputasi dalam game, game multi pemain, game sosial, game simulasi dan game economy.
- Mahasiswa mampu mengembangkan sebuah game dengan menerapkan salah satu atau lebih aspek komputasi, jaringan, simulasi ataupun sosial.

POKOK BAHASAN

Komputasi dalam game, game simulasi, game multi pemain, game sosial, game economy

PRASYARAT

Interaksi Manusia dan Komputer.

PUSTAKA

- Social Game Design, Monetization Methods and Mechanics, Tim Fields 2012
- Theory of Fun for Game Design, Ralph Koster, 2nd Edition Nov 2013

- David Michael, “Serious Games, Games that Educate, Train and Inform”, Thomson Course Tech, Canada, 2005

MATA KULIAH	Nama MK	: Komputasi Awan
	Kode MK	: IF184942
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Komputasi awan merupakan paradigma baru di dalam industri layanan teknologi informasi. Teknologi komputasi awan berorientasi kepada user dalam hal layanan, penyediaan sumber daya komputasi secara transparan. Mata kuliah ini akan membahas tentang dasar dan pengenalan terhadap teknologi awan, mekanisme, dan arsitekturnya beserta teknologi dan riset terkini dalam komputasi awan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa dapat menjelaskan dan memahami karakteristik dari komputasi awan.
- Mahasiswa dapat menjelaskan dan menerapkan konsep multitenancy dalam komputasi awan.
- Mahasiswa dapat menjelaskan dan menerapkan delivery model pada komputasi awan.
- Mahasiswa dapat menerapkan teknologi komputasi awan pada skala kecil.
- Mahasiswa mampu menjelaskan aspek pendukung teknologi komputasi awan dan juga mekanisme keamanan.
- Mahasiswa mampu menjelaskan arsitektur komputasi awan.

POKOK BAHASAN

- Konsep dan Model: Teknologi, Security
- Cloud Characteristic : Batasan, On demand Usage, Ubiquitous Access, Multitenancy, Elasticity, Measured Usage
- Delivery Model : IaaS, PaaS, SaaS
Deployment : Public, Community, Private, Hybrid
Teknologi : Internet, Data Center, virtualisasi, Web, Service, Multitenancy, Cloud infrastructure software
Keamanan Cloud Computing-- Threat, Cloud Security Threats
Mekanisme Keamananan Cloud Computing -- Public
Key Infrastructure, Hashing, Digital Signature, SSO, Virtual Server
- Arsitektur - Workload Distribution, Resource Pooling, Dynamic Scalability
Arsitektur - Elastic Resource Capacity, Service Load Balancing, Cloud Bursting.

PRASYARAT

Jaringan Komputer

PUSTAKA

- Thomas Erl et al, "Cloud Computing, Concepts, Technology. And Architecture". Prentice Hall.
- Hill et al, "Guide to Cloud Computing, Principles and Practice". Springer.Jeniq-Neng Hwang, "Multimedia Networking From Theory to Practice", Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, "Fundamentals of Multimedia", Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy,"QoS Measurement and Evaluation of Telecommunications Quality of Service", Wiley, 2001. ISBN 0470845910.

MATA KULIAH	Nama MK	: Komputasi Bergerak
	Kode MK	: IF184943
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar tentang konsep dan permasalahan dalam lingkungan komputasi bergerak serta mampu membangun sistem yang berjalan dalam lingkungan komputasi bergerak.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAKANKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu memahami konsep dan permasalahan dalam lingkungan komputasi bergerak serta mampu membangun sistem yang berjalan dalam lingkungan komputasi bergerak. Mahasiswa diharapkan memiliki kemampuan untuk membangun sistem yang mampu bekerja dalam lingkungan bergerak dengan pemahaman teknologi yang mendukung pengembangan sistem tersebut dengan kinerja individu ataupun secara berkelompok dalam kerjasama tim.

POKOK BAHASAN

- Lingkungan Bergerak dan Teknologi Pendukungnya
- Karakteristik dan dimensi sistem yang bekerja pada lingkungan bergerak

- Pemodelan dan Karakteristik mobilitas pada lingkungan bergerak
- Manajemen lokasi oleh sistem yang bekerja pada lingkungan bergerak.
- Jaringan Ad Hoc dan Delay Tolerant beserta keterbatasan dan keunggulannya
- Isu-isu terkait Mobile Information Access dan Adaptasi Aplikasi terkait lokasi, energy , ketersediaan resource etc
- Spontaneous Networking, Mobile Peer-to-Peer dan Aplikasinya.
- Routing di Ad Hoc Network dan Delay Tolerant Network
- Isu-isu riset dalam komputasi bergerak

PRASYARAT

Jaringan Komputer

PUSTAKA

- Abdessalam Helal, Et.Al,” Anytime, Anywhere Computing, Mobile Computing Concepts and Technology” , McGraw-Hill,
- Mobile Computing Principles Designing And Developing Mobile Applications With Uml And Xml and the Environment”, Oxford Publisher 2002.
- Location Management and Routing in Mobile Wireless Networks,Amitava Mukherjee, Somprakash Bandyopadhyay, Debashis Saha, Artech House Publisher
- Andreas Heinemann, Max Muhlhauser", Peer-to-Peer Systems and Application
- Mohammad Ilyas and Imad Mahgoub, Mobile Computing Handbook, Auerbach PublicationHill et al, “Guide to Cloud Computing, Principles and Practice”. Springer.Jeniq-Neng Hwang, “Multimedia Networking From Theory to Practice”, Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, “Fundamentals of Multimedia”, Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy,”QoS Measurement and Evaluation of Telecommunications Quality of Service”, Wiley, 2001. ISBN 0470845910.

MATA KULIAH	Nama MK	: Sistem Terdistribusi
	Kode MK	: IF184944
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mengkoordinasikan banyak proses dalam banyak komputer yang terhubung melalui jaringan lokal atau internet untuk mencapai satu tujuan tertentu.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mengetahui dan menerapkan konsep dan algoritme dalam sistem terdistribusi. Mampu mengaplikasi konsep tersebut dalam banyak mesin sehingga terhubung dan bekerja sama untuk satu masalah tertentu.

POKOK BAHASAN

- Introduction to distributed systems: concepts, goals, and limitations
- Interprocess communication: message passing, remote procedure calls, distributed objects and naming
- Distributed systems-based programming: UDP/TCP socket and the use of middleware
- Indirect communication (publish subscribe and tuple space)
- Middleware for distributed systems (middleware for publish subscribe, map reduce, peer to peer, and message queue)
- Concepts, standards, and middleware on multi-agent and mobile agent
- Distributed file systems and examples of its application

- | |
|---|
| <ul style="list-style-type: none">• Research topic in mobile computing, pervasive computing, ubiquitous computing, and cloud computing• The issue of research in distributed systems (load balancing, load estimation, load migration, and big data) |
|---|

PRASYARAT

Jaringan Komputer

PUSTAKA

- | |
|---|
| <ul style="list-style-type: none">• Coulouris, G., Dollimore, J., Kindberg, T., Blair, G., “Distributed Systems: Concepts and Design 5th Edition”, Addison-Wesley, 2011 |
|---|

MATA KULIAH	Nama MK	: Forensik Digital
	Kode MK	: IF184945
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Forensik Digital mempelajari berbagai metode forensik pada lingkungan berkas, sistem operasi, web, jaringan komputer, dan pada perangkat bergerak serta mengenal teknik antiforensik.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalan data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menerapkan metode forensik pada lingkungan berkas, sistem operasi, web, jaringan komputer, dan pada perangkat bergerak serta mengenal teknik antiforensik.

POKOK BAHASAN

- Prinsip dasar dan metodologi forensik digital
- Pengenalan, pencarian, dan penyitaan barang bukti digital
- Teknik preservasi data
- Forensik pada sistem operasi
- Forensik pada berkas

- Forensik pada web
- Forensik pada jaringan komputer
- Forensik pada perangkat bergerak
- Investigasi serangan pada jaringan komputer
- Teknik antiforensik

PRASYARAT

Jaringan Komputer

PUSTAKA

- Nelson, B., “Guide to Computer Forensics and Investigations”, Cengage Learning, 2009
- Casey, E., “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet”, Academic Press, 2011
- Casey, E., “Handbook of Digital Forensics and Investigation”, Academic Press, 2009
- Sammons, J., “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, Elsevier, 2012
- Altheide, C., Carvey, H., “Digital Forensic with Open Source Tools”, Elsevier, 2011
- Hoog, A., “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier, 2011
- Daniel, L., Daniel, L., “Digital Forensics for Legal Professionals Understanding Digital Evidence From The Warrant To The Courtroom”, Elsevier, 2011

MATA KULIAH	Nama MK	: Data Mining
	Kode MK	: IF184951
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa akan mempelajari tentang proses pencarian pola dan relasi dari berbagai perspektif di suatu dataset dengan memanfaatkan metode-metode kecerdasan komputasional. Pola dan relasi yang ditemukan akan diolah menjadi informasi yang bermanfaat untuk mendukung pengambilan keputusan atau penyelesaian suatu masalah.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mengetahui tentang bermacam-macam tipe data dan beberapa sumber data (database, warehouse, transaksional, WWW)
- Mahasiswa memahami konsep dan mampu menerapkan teknik pre-prosesing data.
- Mahasiswa mampu membuat sistem untuk penggalian data dan analisa pola data dengan menerapkan metode-metode kecerdasan komputasional dan metode probabilistik.
- Mahasiswa mampu menganalisis dan menyelesaikan suatu permasalahan dalam suatu studi kasus dengan memanfaatkan sistem penggalian data

POKOK BAHASAN

Pengenalan tipe-tipe data (nominal, binary, numerik) dari berbagai sumber data (database, warehouse, transaksional, WWW). Selanjutnya akan dibahas tentang beberapa cara untuk menghitung similarity dan dissimilarity serta beberapa teknik preprosesing data antara lain: pembersihan, integrasi, reduksi, transformation, diskritisasi. Materi berikutnya adalah tentang pemanfaatan metode klasifikasi, clustering, asosiasi dan regresi untuk proses penggalian dan analisa data. Pada tahap selanjutnya, mahasiswa akan diberikan sebuah permasalahan studi kasus dan mahasiswa akan menganalisis serta menyelesaikan permasalahan tersebut dengan membuat sebuah sistem yang mampu memberikan solusi berdasarkan proses menemukan pola yang ada di sebuah data.

PRASYARAT

Kecerdasan Buatan

PUSTAKA

- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Addison-Wesley, 2005.
- Han, Jiawei; Kamber, Micheline, "DATA MINING : CONCEPT AND TECHNIQUES", Morgan Kaufman Pub, 2001
- Rajaraman, Anand, "Mining of Massive Datasets", Stanford University, 2011

MATA KULIAH	Nama MK	: Komputasi Biomedik
	Kode MK	: IF184953
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini mahasiswa akan mempelajari komputasi yang diaplikasikan di bidang biomedik. Pada mata kuliah ini, mahasiswa akan belajar mengenai berbagai macam format dan sifat data-data biomedik seperti data hasil lab, data sinyal (ECG, EEG), data citra medis (X-Ray, MRI, USG, Patologi) dan data gen (DNA, Microarray, protein). Data-data tersebut akan dianalisis dan dimodelkan menggunakan metode-metode statistik dan machine learning untuk menjawab permasalahan-permasalahan di bidang biomedik.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalan data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mengidentifikasi permasalahan di bidang biomedik
- Mahasiswa mampu menganalisis permasalahan biomedik berdasarkan data-data biomedik yang tersedia.
- Mahasiswa mampu merancang dan mengimplementasikan metode-metode statistik dan machine learning untuk memodelkan solusi di bidang biomedik.

POKOK BAHASAN

Pengantar biomedik, deskripsi data biomedik (data numeric, data sinyal, data citra dan data gene), analisis dan pemodelan data biomedik menggunakan metode probabilistic, klasifikasi, clustering dan regresi.

PRASYARAT

Kecerdasan Komputasional

PUSTAKA
Biomedical Informatics, Edward C Shortlife & James J. Cimino

MATA KULIAH	Nama MK	: Sistem Temu Kembali Informasi
	Kode MK	: IF184955
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Mahasiswa akan mempelajari teknik-teknik pengolahan data teks untuk menemukan kembali informasi pada data berbentuk teks. Bahasan perkuliahan meliputi pengolahan awal, ekstraksi fitur, penghitungan tingkat kemiripan teks sesuai masukan query, dan menampilkan hasil pencarian. Bahasan lanjut adalah teknik relevance feedback, klasifikasi dan klasterisasi teks untuk membantu pengguna dalam pencarian. Mahasiswa akan merancang, menganalisis serta mengaplikasikan metode-metode sistem temu kembali informasi pada berbagai permasalahan nyata baik secara mandiri atau kerjasama tim.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan berbagai konsep, teori, istilah dalam berbagai macam model sistem temu kembali informasi beserta pengaplikasiannya

- Mahasiswa mengimplementasikan teknik-teknik penyelesaian masalah seperti pengindeksan, pencarian, pemrosesan query dalam kebutuhan temu kembali informasi.

POKOK BAHASAN

- Model temu kembali dengan boolean, vector space, probabilistic, library lucene, evaluasi performa, relevance feedback, pencarian web, pengklasifikasi dan pengklasteran
- Aplikasi: temu kembali berbasis citra, latent semantic indexing, sistem rekomendasi, ekstraksi informasi

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

- Ricardo Baeza-Yates, Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search 2nd Ed”, Addison-Wesley, New Jersey, 2011
- Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008

MATA KULIAH	Nama MK	: Visi Komputer
	Kode MK	: IF184956
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Visi komputer bertujuan untuk mendapatkan informasi dan mengambil sebuah keputusan dari sebuah atau sekumpulan citra yang diobservasi. Visi komputer menggabungkan konsep-konsep dari ‘pengolahan citra’ dan ‘kecerdasan komputasional’. Visi komputer memiliki sejumlah aplikasi yang beragam, antara lain aplikasi medis, pengawasan (seperti pengenalan wajah), inspeksi industri, pencitraan satelit, dll. Mata kuliah ini berisi topik-topik seperti ekstraksi fitur, segmentasi dan pengenalan objek. Selain itu juga berisi tentang kalibrasi kamera, geometri projektif, dan bagaimana informasi tiga dimensi dapat direkonstruksi dari sebuah citra, citra stereo dan motion.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan permasalahan-permasalahan visi komputer dalam tulisan.
- Mahasiswa mampu membuat MATLAB *code* untuk memecahkan permasalahan-permasalahan visi komputer.
- Mahasiswa mampu menjelaskan teori-teori dan prinsip-prinsip dalam visi komputer.
- Mahasiswa mampu melakukan riset mandiri pada topik tertentu, menulis laporan riset dengan ruang lingkup kecil, dan mempresentasikannya secara lisan.

- Mahasiswa mampu mengkritisi berbagai metode untuk memecahkan permasalahan-permasalahan visi komputer.

POKOK BAHASAN

- Pendahuluan: pembentukan citra, model-model kamera, geometri perspektif, pengenalan sistem-sistem visi komputer terkini.
- Review Pengolahan Citra Digital: Analisis Citra Biner, Transformasi Fourier dan Analisis Citra Abu-abu.
- Pengenalan objek dan Klasifikasi: Ekstraksi fitur, Deteksi tepi.
- Rekonstruksi 3D: Kalibrasi kamera, geometri proyektif, Stereo, epipolar geometry, dan structured light systems.
- Optical flow dan tracking.
- 3D shape analysis dan matching.

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

- Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag, London, 2011.
- David A. Forsyth dan Jean Ponce, "Computer Vision: A Modern Approach, 2nd Edition", Prentice Hall, 2012.
- Christian Wöhler, "3D Computer Vision: Efficient Methods and Applications", Springer-Verlag, Berlin Heidelberg, 2009.
- Francisco Escolano, Pablo Suau, Boyán Bonev, "Information Theory in Computer Vision and Pattern Recognition", Springer Verlag, London, 2009.

MATA KULIAH	Nama MK	: Rekayasa Pengetahuan
	Kode MK	: IF184962
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar mengenai konsep tacit knowledge dan teknik-teknik dalam rekayasa pengetahuan terkait dengan proses menangkap, memodelkan, membagi, dan menggunakan pengetahuan secara efektif. Di akhir perkuliahan, mahasiswa diharapkan mampu untuk mengimplementasikan rekayasa pengetahuan ke dalam aplikasi baik secara mandiri maupun kerjasama.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menentukan pendekatan, metode, kerangka kerja, dan kaskas bantu rekayasa pengetahuan untuk menyelesaikan permasalahan terkini.

POKOK BAHASAN

- Pengenalan tentang Rekayasa Pengetahuan: Data, informasi dan pengetahuan, teknik-teknik mendapatkan pengetahuan, teknik pemodelan pengetahuan.
- Akuisisi Pengetahuan: definisi akuisisi pengetahuan, metode dan teknik untuk akuisisi pengetahuan.
- Validasi pengetahuan: definisi, parameter dan proses pengukuran validasi, teknik dan metode validasi pengetahuan.
- Representasi Pengetahuan: definisi, proses rekayasa pengetahuan, teknik-teknik dalam rekayasa pengetahuan.
- Inferensi, Explanation & Justification
- Semantic Web: semantic web roadmap, ontology and knowledge representation on semantic web, semantic web education, layer cake, XML, RDF/S.

- Aplikasi rekayasa pengetahuan untuk menyelesaikan permasalahan nyata terkini

PRASYARAT

Sistem Basis Data

PUSTAKA

- Simon Kendal and Malcolm Creen, an Introduction to Knowledge Engineering, Springer, 2006.
- R.J. Brachman and H.J. Levesque, Knowledge Representation and Reasoning, Elsevier, 2004.
- Segaran, Evans, and Taylor, Programming the Semantic Web, O'Reilly, 2009.

MATA KULIAH	Nama MK	: Audit Sistem
	Kode MK	: IF184963
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Audit sistem mempelajari konsep audit teknologi informasi, fungsi prosedur kontrol, pengelolaan risiko dan penyelamatan terhadap bencana demi kelangsungan bisnis. Kuliah ini membahas perencanaan dan pelaksanaan audit serta pembuatan rekomendasi untuk peningkatan kinerja sistem. Juga mempelajari cara investigasi, pengujian, evaluasi kematangan dan kepatutan terhadap prosedur standard dan tata kelola teknologi informasi.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami peran dan tujuan audit teknologi informasi
- Mahasiswa mampu mengidentifikasi risiko proses dan informasi yang berkaitan dengan kerahasiaan, integritas dan ketersediaan
- Mahasiswa mampu merancang dan melaksanakan proses audit yang sesuai keperluan enterprise
- Mahasiswa mampu merancang dan mengimplementasi prosedur dan pengukuran kontrol untuk mengelola risiko secara efektif.
- Mahasiswa mampu membuat rekomendasi untuk peningkatan kinerja sistem dengan mengacu pada contoh penerapan terbaik (best practice), standard dan peraturan tata kelola teknologi informasi.
- Mahasiswa mampu membangun penyelamatan bencana (disaster recovery) dan rencana kelangsungan bisnis (business continuity plans)

POKOK BAHASAN

Perencanaan dan pelaksanaan aktifitas audit. Metode investigasi, pengujian, evaluasi kematangan dan kepatutan terhadap prosedur standard dan dokumen yang berlaku. Rekomendasi untuk meningkatkan efektifitas manajemen risiko, kontrol dan proses tata kelola sistem.

PRASYARAT

PUSTAKA

- Riyanarto Sarno, Audit Sistem Informasi/Teknologi Informasi, ITS Press, 2009.
- Riyanarto Sarno, Strategi Sukses Bisnis dengan Teknologi Informasi Berbasis Balanced Scorecard dan COBIT, ITS Press, 2009, ISBN 978-979-8897-42-9.
- Simha R. Magal, Integrated Business Processes with ERP Systems, John Wiley & Sons, Inc., 2012
- Riyanarto Sarno & Irsyat Iffano, Sistem Manajemen Keamanan Informasi, ITS Press, 2009

MATA KULIAH	Nama MK	: Big Data
	Kode MK	: IF184966
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa akan mempelajari tren dan aspek-aspek yang ada di dalam *big data* (data dengan skala besar). Mata kuliah ini menekankan pada pengenalan serta implementasi sistem penyimpanan data dengan skala (*volume*), jenis (*variety*), dan kecepatan penyimpanan data (*velocity*) yang besar. Selain itu akan dibahas juga mengenai beberapa teknik pemrosesan data dan penggalan data untuk big data.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami desain dan arsitektur beberapa sistem penyimpanan data berskala besar (Hadoop, graph based database, dll.)
- Mahasiswa memahami dan mampu menerapkan beberapa metode penggalan data untuk data berskala besar
- Mahasiswa mampu menerapkan kaidah-kaidah big data di dalam kasus nyata (sistem rekomendasi konten, iklan, dan jejaring sosial).
- Mahasiswa memahami dan mampu menerapkan optimasi dalam pengolahan data berskala besar.

POKOK BAHASAN

- Data Mining
- MapReduce
- Finding Similar Items (Near-Neighbor Search, Shingling of Documents).
- Penggalan Data Streams (Mining Data Streams)
- Analisis Tautan (Link Analysis)
- Frequent Itemsets
- Clustering
- Advertising on the Web

- Sistem Rekomendasi
- Penggalan Graph Jejaring Sosial (Mining Social-Network Graphs)
- Reduksi Dimensi (Dimensionality Reduction)

PRASYARAT

Sistem Basis Data

PUSTAKA

- J. Leskovec, A. Rajaraman and J. Ullman, "Mining of Massive Datasets," 15 August 2014. [Online]. Available: <http://www.mmms.org/>
- H. Cuesta, Practical Data Analysis, Birmingham: Packt Publishing Ltd., 2013.
- V. Mayer-Schönberger and K. Cukier, Big Data: A Revolution That Will Transform How We Live, Work, and Think, New York: Eamon Dolan/Houghton Mifflin Harcour, 2013.
- N. Sawant and H. Shah, Big Data Application Architecture Q&A, A Problem - Solution Approach, New York: Apress, 2013.
- P. Giacomelli, Apache Mahout Cookbook, Mumbai: Packt Publishing, 2013.
- V. Prajapati, Big Data Analytics with R and Hadoop (Community Experience Distilled), Mumbai: Packt Publishing, 2013.

MATA KULIAH	Nama MK	: Evolusi Perangkat Lunak
	Kode MK	: IF184973
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar tentang perangkat lunak sebagai sebuah entitas yang terus berkembang dan kompleks. Selain itu, mereka juga dibekali pemahaman mengenai isu-isu umum yang terkait dengan pemeliharaan perangkat lunak, pengetahuan tentang pentingnya perancangan perangkat lunak terkait dengan usaha pemeliharaannya, teknik-teknik rekayasa balik tingkat tinggi untuk meningkatkan interoperabilitas dengan data warisan dan lingkungannya, serta pemahaman dasar teknik-teknik rekayasa balik tingkat rendah/dasar untuk meningkatkan interoperabilitas perangkat lunak. Pada beberapa bahasan, diberikan juga studi kasus agar mahasiswa dapat mengaplikasikan teori, konsep, dan teknik tertentu ada kasus yang diberikan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;

Keterampilan Khusus:

Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan konsep terkait dengan aktivitas, istilah, teknik, dan metode yang ada di bidang evolusi perangkat lunak.

• Mahasiswa mampu menerapkan konsep tersebut ke dalam sebuah studi kasus yang dibantu oleh kakas bantu dalam penyelesaiannya, baik secara individu maupun kerja sama tim.
POKOK BAHASAN
• PETA JALAN DAN STUDI EMPIRIS: sejarah dan tantangan dalam evolusi perangkat lunak (PL); persamaan dan perbedaan evolusi dengan perawatan PL; topik-topik penelitian evolusi PL. • LEHMAN'S LAWS: Hukum Lehman dalam evolusi PL, pengenalan tipe sistem S-, P-, dan E-. • AKTIFITAS EVOLUSI PL: Jenis perawatan corrective, adaptive, perfective, dan preventive; aktifitas ketertelusuran PL; analisa efek perubahan; kakas/diagram dalam evolusi PL seperti DDG, CFG, dll. • PROGRAM COMPREHENSION: visualisasi struktur program; analisa kode statis; control dependencies, missal CFG. • CODE CLONING: pengenalan cloning; jenis cloning; sumber / asal cloning; evolusi cloning; manajemen dan deteksi clone; teknik penghilangan clone; algoritma dan perkembangan clone. • SOFTWARE REPOSITORIES: pengenalan dan analisis repositori PL; release history. • PREDIKSI KESALAHAN: prediksi kesalahan dari sejarah & log pembangunan PL; penyebab PL rawan cacat, metriks PL.; teknik prediksi kesalahan dengan menggunakan code churn; isu-isu terkait; ancaman terhadap validitas. • REFACTORING: teknik refactoring, penghilangan bad smell; keuntungan, resiko, dan biaya refactoring. • KAKAS BANTU EVOLUSI PL: kakas bantu pendeteksi klon kode dan ode bad smell; kakas bantu repositori PL • METRIK PL: jenis-jenis metric seperti LOC, metric agregasi, metric struktur dan modular untuk program berbasis objek, metric paket, metric churn, dan metric estimasi biaya dan waktu.
PRASYARAT
Analisis dan Perancangan Sistem Informasi
PUSTAKA
• Stephan Diehl, Software Visualization: Visualizing the Structure, Behaviour, and Evolution of Software, Springer-Verlag, Berlin, 2007. • Nazim H. Madhavji, Juan Fernandez-Ramil, dan Dewayne Perry, Software Evolution and Feedback: Theory and Practice, John Wiley & Sons, England, 2006. • J. Fernandez-Ramil et al., Empirical Studies of Open Source Evolution. • R. Koschke, Identifying and Removing Software Clones.

- E. Duala-Ekoko and M.P. Robillard, Tracking Code Clones in Evolving Software, In Proceedings of the 29th International Conference on Software Engineering.
- Z. Li and Y. Zhou, PRMiner: Automatically Extracting Implicit Programming Rules and Detecting Violations in Large Software Code. Software Engineering Notes, 2005.
- S. Hangal and M.S. Lam, Tracking Down Software Bugs Using Automatic Anomaly Detection. In Proceedings of the 24th International Conference on Software Engineering, 2002.
- D'Ambros et al., Analyzing Software Repositories to Understand Software Evolution.

MATA KULIAH	Nama MK	: Konstruksi Perangkat Lunak
	Kode MK	: IF184974
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada perkuliahan ini, mahasiswa akan melakukan tahap-tahap yang ada di dalam fase konstruksi secara detail dan hati-hati untuk menghasilkan perangkat lunak yang berkualitas tinggi, dan mudah dirawat (*high maintainability*). Mahasiswa akan melakukan proses desain detail, *coding* dan *testing* dalam sebuah studi kasus konstruksi yang memperhatikan keterbacaan kode, keterawatan kode, meminimalisir *bug* dan *error*. Mahasiswa juga dapat melakukan kolaborasi antar pengembang dan melakukan integrasi perangkat lunak.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip: perancangan dan pembangunan perangkat lunak dengan metode perencanaan, rekayasa kebutuhan, perancangan, pengimplementasian, pengujian, dan peluncuran yang baku dan ilmiah, dan menghasilkan produk perangkat lunak yang memenuhi berbagai parameter kualitas secara teknis maupun manajerial, dan berdaya guna serta menguasai konsep dan prinsip-prinsip: pembuatan program sederhana dalam bahasa pemrograman umum maupun bahasa pemrograman berorientasi objek, pembuatan aplikasi web dan aplikasi desktop, pembuatan basisdata sederhana untuk menyelesaikan permasalahan dalam konteks pengembangan perangkat lunak secara umum;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menganalisa, merancang dan membangun perangkat lunak dengan menggunakan prinsip-prinsip proses rekayasa perangkat lunak untuk menghasilkan perangkat lunak yang memenuhi kualitas baik secara teknis dan manajerial;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model

pemrograman yang mendasari berbagai bahasa pemrograman yang ada, serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan kompleksitas esensial dan accidental pada pengembangan perangkat lunak.
- Mahasiswa mampu menjelaskan tahapan-tahapan dalam fase konstruksi perangkat lunak.
- Mahasiswa mampu menerjemahkan desain detail (detailed design) perangkat lunak ke dalam kode program.
- Mahasiswa mampu menentukan platform, bahasa, dan kaskas yang dibutuhkan sesuai dengan tipe perangkat lunak yang akan dibangun.
- Mahasiswa mampu membangun perangkat lunak menggunakan praktik terbaik dalam proses coding, debugging, testing, dan integration.
- Mahasiswa mampu menghasilkan kode program yang berkualitas tinggi.
- Mahasiswa mampu melakukan penyempurnaan kode program.
- Mahasiswa mampu melakukan kolaborasi dan integrasi perangkat lunak.

POKOK BAHASAN

- Fase-fase dalam konstruksi perangkat lunak.
- Metafora dalam konstruksi perangkat lunak.
- Prasyarat-prasyarat dalam konstruksi perangkat lunak.
- Pendekatan pada konstruksi perangkat lunak.
- Membuat kode berkualitas: membuat class, membuat prosedur atau rutin.
- Version control system: alur kerja menggunakan Git (commit, push, pull, dan branching).
- Defensive programming: penanganan error, asersi, eksepsi, dan debugging.
- Konvensi penulisan kode: penggunaan variabel dan tipe data, penamaan variabel, layout kode.
- Organisasi statemen: struktur percabangan, perulangan.
- Penyempurnaan kode: unit testing, debugging, dan refactoring.
- Integrasi: pendekatan integrasi, strategi incremental, daily build, dan smoke test.
- Studi kasus konstruksi perangkat lunak.

PRASYARAT

Analisis dan Perancangan Sistem Informasi dan Perancangan Perangkat Lunak (ambil)

PUSTAKA

- McConnell, S. Code Complete: A Practical Handbook of Software Construction, 2nd Edition. Redmond, Wash: Microsoft Press, 2004.
- Fowler, Martin, and Kent Beck. Refactoring: Improving the Design of Existing Code. Reading, MA: Addison-Wesley, 1999.
- Martin, Robert C., and Micah Martin. Agile Principles, Patterns, and Practices in C#. Upper Saddle River, NJ: Prentice Hall, 2007.
- Brooks, Frederick P. The Mythical Man-month Essays on Software Engineering. - Anniversary Ed. Reading, Mass.: Addison-Wesley Pub., 1995.
- Gamma, Erich. Design Patterns: Elements of Reusable Object-oriented Software. Reading, Mass.: Addison-Wesley, 1995.

MATA KULIAH	Nama MK	: Teknologi IoT
	Kode MK	: IF184914
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Mata kuliah ini membahas tentang bagaimana konsep teknologi IoT, dan aspek-aspek yang mampu didukungnya. Didalamnya juga dibahas tentang bagaimana menggunakan piranti untuk menunjang penerapan teknologi IoT dan interaksinya dengan manusia.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

- Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Memberikan pengetahuan dan implementasi jaringan sensor nirkabel dan menggunakan piranti komputasi yang berwujud fisik, dalam arti mengembangkan lebih banyak jenis perangkat komputer yang dapat digunakan di lingkungan fisik.
- Mengetahui pengembangan teknologi yang tersebar dan dirancang untuk beroperasi secara harmonis dalam lingkungan manusia dan sosial

POKOK BAHASAN

Ubiquitous Computing: Basics and Vision, Modelling the Key Ubiquitous Computing, Ubiquitous System Environment Interaction, Architectural Design for UbiCom Systems: Smart DEI Model; Smart Devices and Services: Service Architecture Models, Service Provision Life Cycle, Virtual Machines and Operating Systems; Human–Computer Interaction : User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices; Tagging, Sensing and Controlling : Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real Time Systems, Control System and Robots; Context-Aware Systems : Modelling Context Aware Systems, Mobility Awareness, Spatial Awareness, Temporal Awareness: Coordinating and Scheduling, ICT System Awareness; Intelligent Systems (IS) : Basic Concepts, IS Architectures, Semantic Knowledge Based IS, Classical Logic IS, Soft Computing IS Models, IS System Operations; Ubiquitous Communication : Audio Networks, Data Networks, Wireless Data Networks; Management of Smart Devices : Managing Smart Devices in Virtual Environments, Managing Smart Devices in Human User Centred Environments, Managing Smart Devices in Physical Environments

PRASYARAT

Jaringan Komputer

PUSTAKA

- Stefan Poslad, Ubiquitous Computing Smart Devices, Environments, and Interaction, JohnWiley&Sons, Ltd., 2009
- Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill, 2005

MATA KULIAH	Nama MK	: Perancangan Keamanan Sistem dan Jaringan
	Kode MK	: IF184913
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Mahasiswa belajar berbagai hal lebih lanjut mengenai keamanan aplikasi, software berbahaya, analisis software berbahaya, dan keamanan jaringan

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu merancang sistem dan jaringan komputer dengan resiko keamanan sekecil mungkin. Berdasarkan konsep-konsep tersebut, mahasiswa mampu mengaplikasikannya, baik secara individu maupun secara berkelompok dalam tim

POKOK BAHASAN

- KEAMANAN APLIKASI: Keamanan Email, User authentication Protocol (Kerberos, RADIUS, dsb), dan Web Application Firewall.
- ANALISIS SOFTWARE BERBAHAYA: Sistem Deteksi Intrusi, Honeypot, Analisis Malware.
- KEAMANAN JARINGAN: Routing Protocol, VPN, IPSec

PRASYARAT

Keamanan Informasi dan Jaringan

PUSTAKA

- Intrusion Detection Networks: A Key to Collaborative Security by Carol Fung and Raouf Boutaba (Nov 19, 2013)
- Cryptography and Network Security: Principles and Practice (6th Edition) by William Stallings (Mar 16, 2013).

- Network and System Security, Second Edition by John R. Vacca (Sep 23, 2013).
- Network Security Essentials: Applications and Standards (4th Edition) by William Stallings (Mar 22, 2010).
- Information Security The Complete Reference, Second Edition by Mark Rhodes-Ousley (Apr 3, 2013)

MATA KULIAH	Nama MK	: Analisis Data Multivariat
	Kode MK	: IF184922
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada mata kuliah ini, mahasiswa akan belajar memahami Konsep dasar data multivariat, Aljabar multivariat, Multivariat Normal, Pemetaan Teknik Univariat dan multivariat, Eksplorasi data multivariat/Analisis Deskriptif Multivariat. Selanjutnya mahasiswa akan mampu melakukan pemodelan dan analisis dengan berbagai metode analisis multivariat, yaitu Model Multiple Dependent: MANOVA, PCA, Canonical Analysis. Klasifikasi dan Pengelompokan: Analisis Kelompok, Analisis Diskriminan. Teknik Reduksi Data: Analisis Faktor. Perceptual Mapping: Multidimensional Scaling, Correspondence Analysis, Conjoint Analysis, Structural Equation Modeling.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalan data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer;
- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

• Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
CAPAIAN PEMBELAJARAN MATA KULIAH
• Mahasiswa dapat menjelaskan perbedaan analisa univariat dan multivariat • Mahasiswa dapat menggunakan berbagai pemodelan multivariat sesuai tujuan analisis • Mahasiswa dapat menganalisis hasil pengolahan data multivariat • Mahasiswa dapat menggunakan software pengolahan data statistik multivariat.
POKOK BAHASAN
Konsep dasar data multivariat, Aljabar multivariat, Multivariat Normal, Pemetaan Teknik Univariat dan multivariat, Eksplorasi data multivariat/Analisis Deskriptif Multivariat, Model Multiple Dependent: MANOVA, PCA, Canonical Analysis. Klasifikasi dan Pengelompokan: Analisis Kelompok, Analisis Diskriminan. Teknik Reduksi Data: Analisis Faktor. Perceptual Mapping: Multidimensional Scaling, Correspondence Analysis, Conjoint Analysis. Structural Equation Modeling: Penggunaan tools.
PRASYARAT
Probabilitas dan Statistika
PUSTAKA
• Barbara G. Tabachnick, Linda S. Fidell, "Using Multivariate Statistics", 5th Edition, Pearson International Edition, 2007. • Joseph F. Hair, Jr., William C. Black, dkk "Multivariate Data Analysis", 7th Edition, Pearson International Edition, 2010 . • Pendukung : • Richard A. Johnson, Dean W. Wichern, "Applied Multivariate Statistical Analysis", Prentice Hall International Inc., 2007.

MATA KULIAH	Nama MK	: Animasi Komputer dan Pemodelan 3D
	Kode MK	: IF184933
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa mempelajari berbagai aspek yang diperlukan dalam membangun game yang kompleks. Mahasiswa akan mempelajari serious game, game simulasi, komputasi dalam game, jaringan untuk game, game multi pemain, social game dan game economy.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer;

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami metodologi pengembangan software (analisa, design, coding, testing, dokumentasi) dan mampu menerapkan metodologi tersebut pada persoalan-persoalan sederhana.
- Mahasiswa mampu merancang program secara modular/terstruktur dengan pendekatan top-down menggunakan fungsi-fungsi.
- Mahasiswa mampu mengimplementasikan algoritma dengan benar dan terstruktur menggunakan bahasa C.
- Mahasiswa mampu melakukan proses debugging dan pengujian.
- Mahasiswa mampu berpikir komprehensif dalam merancang dan mengimplementasi program.
- Mahasiswa mampu berkomunikasi dan bekerja sama dalam sebuah tim melalui mekanisme dokumentasi program.
- Mahasiswa mampu menuangkan hasil pemikirannya dalam bahasa lisan maupun tulisan dengan baik.

POKOK BAHASAN

Konsep Pemrograman, definisi dan contoh algoritma, flowchart, Pemrograman dengan implementasi decision (tanpa iterasi): ekspresi, control flow, input & output; Variabel, assignment, perilaku dinamis variabel, debugging; Control flow dengan label (goto), Control flow dengan statement loop (while, for, break, continue), Tipe-tipe data primitif, sifat dan batas-batasnya, Konversi tipe, Array satu dimensi, String sebagai array char, Fungsi-fungsi input / output, Format; Operasi aritmetik, logika, bitwise, Hirarki operator, Konversi implisit dan casting, Permasalahan akurasi; Sorting: Bubble, Selection, linear search, konsep memory, tipe data pointer, aritmetika pointer, operator sizeof, alokasi memori dinamis; fungsi, parameter, return: tipe & perilakunya, rekursif; array multidimensi dengan definisi statis dan alokasi dinamis; routing pada labirin, tic-tac toe, operasi string, implementasi graph pada matriks 2 D, algoritma djikstra, Struct dan union, konsep file, fungsi-fungsi manipulasi, membuat aplikasi katalog, device grafik, fungsi-fungsi manipulasi grafik 2D, membuat gambar dengan komposisi bentuk-bentuk geometris dasar, membuat kurva dengan fungsi matematis, membuat kurva dengan fungsi parameter, membuat game atau editor.

PRASYARAT

Grafika Komputer

PUSTAKA

- Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.

MATA KULIAH	Nama MK	: Game Cerdas
	Kode MK	: IF184935
	Kredit	: 3 SKS
	Semester	: 6

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa mempelajari berbagai aspek yang diperlukan dalam membangun game yang kompleks. Mahasiswa akan mempelajari serious game, game simulasi, komputasi dalam game, jaringan untuk game, game multi pemain, social game dan game economy.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer

Keterampilan Khusus:

Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan berbagai aspek untuk membangun game yang kompleks.
- Mahasiswa mampu menjelaskan aspek komputasi dalam game, game multi pemain, game sosial, game simulasi dan game economy.
- Mahasiswa mampu mengembangkan sebuah game dengan menerapkan salah satu atau lebih aspek komputasi, jaringan, simulasi ataupun sosial.

POKOK BAHASAN

Komputasi dalam game, game simulasi, game multi pemain, game sosial

PRASYARAT

Interaksi Manusia dan Komputer.

PUSTAKA

- Social Game Design, Monetization Methods and Mechanics, Tim Fields 2012
- Theory of Fun for Game Design, Ralph Koster, 2nd Edition Nov 2013
- David Michael, "Serious Games, Games that Educate, Train and Inform", Thomson Course Tech, Canada, 2005

MATA KULIAH	Nama MK	: Komputasi Grid dan Paralel
	Kode MK	: IF184946
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Komputasi paralel beroperasi dalam prinsip bahwa problem yang besar bisa dikerjakan secara cepat dengan cara dipecah, dan dikerjakan secara paralel/bersamaan. Peningkatan pada resource akan membuat kecepatan kerja jauh lebih meningkat. Mata kuliah ini membahas tentang konsep, arsitektur komputasi paralel untuk menyelesaikan kasus-kasus dengan menggunakan pendekatan paralel dengan software dan teknologinya

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;

Keterampilan Khusus:

Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, kon untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami dan dapat menjelaskan konsep dan terminologi dalam bidang komputasi grid dan paralel.
- Mahasiswa memahami dan dapat menjelaskan arsitektur memori pada komputasi paralel.
- Mahasiswa memahami dan dapat menerapkan beberapa model pemrograman pada pemrograman paralel untuk kasus-kasus tertentu.
- Mahasiswa memahami dan dapat menerapkan aspek-aspek khusus dalam perancangan program paralel pada arsitektur multicore.
- Mahasiswa memahami teknologi middleware dalam komputasi paralel dan menerapkannya dengan menggunakan algoritma yang sesuai.

POKOK BAHASAN

Konsep dan Terminologi, Arsitektur Komputer von Neumann, Shared Memory, Distributed Memory, Hybrid Distributed-shared memory, Model Pemrograman dan Komunikasi, Perancangan Program Paralel, Partitioning, Sinkronisasi, Load Balancing. Pemrograman pada Arsitektur Multicore. Pengembangan

Portal Grid, Scheduler & Integrasi Grid Middleware, Open Grid Services Architecture (OGSA).

PRASYARAT

Jaringan Komputer

PUSTAKA

- Ian Foster and Carl Kesselman, The Grid: Blueprint for a New Computing Infrastructure, 2nd edition, Morgan Kaufmann Publishers, San Francisco, USA (2004), ISBN: 1-55860-933-4.
- Vladimir Silva, Grid Computing for Developers, 1st edition, Charles River Media Inc., Massachusetts, USA (2006), ISBN: 1-58450-424-2.
- Tao Yang, Lecture Notes on Parallel Scientific Computing, Department of Computer Science University of California Santa Barbara, CA 93106
- Barry Wilkinson and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd edition, Prentice Hall
- CUDA by Example: An Introduction to General-Purpose GPU Programming, 9780131387683 (0131387685), Addison Wesley, 2010

MATA KULIAH	Nama MK	: Komputasi Pervasif dan Jaringan Sensor
	Kode MK	: IF184947
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Mata kuliah ini membahas tentang bagaimana konsep komputasi pervasif, dan aspek-aspek yang mampu didukungnya. Didalamnya jugadi bahas tentang bagaimana menggunakan piranti untuk menunjang penerapan komputasi pervasive seperti piranti cerdas, context-aware system dan interaksinya dengan manusia.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai konsep dan prinsip arsitektur, sistem dan dasar - dasar jaringan komputer berbasis sistem logika;
- Menguasai konsep teoritis dan prinsip-prinsip tentang komputasi berbasis jaringan dan teknologi terkini yang terkait dengannya, di bidang komputasi terdistribusi dan komputasi bergerak, komputasi multimedia, komputasi berkinerja tinggi serta keamanan informasi dan jaringan;
- Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan komputer;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menerapkan arsitektur komputer, prinsip-prinsip kerja sistem operasi untuk merancang, mengimplementasikan dan mengelola sistem jaringan yang mempunyai kinerja tinggi, aman, dan efisien;
- Mampu menerapkan konsep komputasi berbasis jaringan, komputasi paralel, komputasi terdistribusi untuk menganalisa dan merancang algoritma penyelesaian masalah komputasi di dalam berbagai bidang;

- Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Memberikan pengetahuan dan implementasi jaringan sensor nirkabel dan menggunakan piranti komputasi yang berwujud fisik, dalam arti mengembangkan lebih banyak jenis perangkat komputer yang dapat digunakan di lingkungan fisik.
- Mengetahui pengembangan teknologi yang tersebar dan dirancang untuk beroperasi secara harmonis dalam lingkungan manusia dan sosial

POKOK BAHASAN

Ubiquitous Computing: Basics and Vision, Modelling the Key Ubiquitous Computing, Ubiquitous System Environment Interaction, Architectural Design for UbiCom Systems: Smart DEI Model; Smart Devices and Services: Service Architecture Models, Service Provision Life Cycle, Virtual Machines and Operating Systems; Human–Computer Interaction : User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices; Tagging, Sensing and Controlling : Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real Time Systems, Control System and Robots; Context-Aware Systems : Modelling Context Aware Systems, Mobility Awareness, Spatial Awareness, Temporal Awareness: Coordinating and Scheduling, ICT System Awareness; Intelligent Systems (IS) : Basic Concepts, IS Architectures, Semantic Knowledge Based IS, Classical Logic IS, Soft Computing IS Models, IS System Operations; Ubiquitous Communication : Audio Networks, Data Networks, Wireless Data Networks; Management of Smart Devices : Managing Smart Devices in Virtual Environments, Managing Smart Devices in Human User Centred Environments, Managing Smart Devices in Physical Environments

PRASYARAT

Jaringan Komputer

PUSTAKA

- Stefan Poslad, Ubiquitous Computing Smart Devices, Environments, and Interaction, JohnWiley&Sons, Ltd., 2009
- Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill, 2005

MATA KULIAH	Nama MK	: Kompresi Data
	Kode MK	: IF184948
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Kompresi Data mempelajari berbagai metode kompresi dengan pendekatan statistik, *dictionary*, dan praprosesnya pada data teks, citra, audio, dan video.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

- Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalan data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;
- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;
- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrogram yang ada,

serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menerapkan berbagai metode pada teknik kompresi dengan pendekatan statistik, *dictionary*, dan praprosesnya pada data teks, citra, audio, dan video.

POKOK BAHASAN

- Teknik kompresi pada video: ITU-T H.261
- Pengenalan dasar teknik kompresi
- Pengenalan dasar teori informasi: self-information, entropy, dan efisiensi kode
- Teknik kompresi lossy dan lossless
- Teknik kompresi dengan pendekatan statistik: huffman, adaptive huffman, dan arithmetic
- Teknik kompresi berbasis dictionary: LZ77, LZ78, dan LZW
- Teknik praproses untuk kompresi: MtF dan BWT
- Teknik kompresi pada citra digital: JPEG dan CALIC
- Teknik kompresi pada audio: MPEG

PRASYARAT

Jaringan Komputer

PUSTAKA

- Sayood, K., "Introduction to Data Compression 4th Edition", Morgan Kaufman, San Fransisco, 2012
- Pu, I.M., "Fundamental Data Compression 1st Edition", Butterworth-Heinemann, Burlington, 2006
- Salomon, D., Motta, G., "Handbook of Data Compression 5th Edition", Springer, London, 2010

MATA KULIAH	Nama MK	: Robotika
	Kode MK	: IF184954
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada matakuliah robotika ini, mahasiswa mempelajari konsep robot, macam-macam robot, komponen-komponen robot dan cara kerjanya, mempelajari cara merakit robot dan pemrograman pada robot, memahami tipe-tipe pergerakan robot dan cara mengaplikasikannya, memanfaatkan dan mengaplikasikan berbagai sensor robot, dan mengaplikasikan metode-metode sistem cerdas pada aplikasi robot untuk menyelesaikan berbagai tantangan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numeric

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami konsep, macam-macam robot, komponen-komponen robot dan cara kerjanya.
- Mahasiswa mampu merakit robot.
- Mahasiswa mampu memahami pemrograman robot.
- Mahasiswa memahami tipe-tipe pergerakan robot dan caramengaplikasikannya.
- Mahasiswa mampu memanfaatkan dan mengaplikasikan berbagai sensor robot.
- Mahasiswa mampu mengaplikasikan metode-metode sistem cerdas pada robot.

POKOK BAHASAN

- Pengenalan tentang robot, macam-macam robot, komponen-komponen robot dan cara kerjanya.

- Cara merakit robot.
- Pengenalan bahasa program pada robot (menggunakan RobotC).
- Tipe-tipe pergerakan robot dan cara mengaplikasikannya.
- Berbagai macam sensor pada robot (sensor cahaya, suara, sentuh, dll).
- Pemanfaatan dan pengaplikasian sensor pada robot.
- Pemanfaatan metode-metode sistem cerdas untuk menyelesaikan berbagai tantangan pada robot.

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

- John C. Hansen, LEGO Mindstorms NXT Power Programming : Robotics in C, second edition, Variant Press, 2009
- Kim, Yong-Tae, Kobayashi, Ichiro, Kim, Euntai, Soft Computing in Advanced Robotics, Springer
- Robin R. Murphy, Introduction to AI Robotics, The MIT Press, 2000

MATA KULIAH	Nama MK	: Analisis Jejaring Sosial
	Kode MK	: IF184957
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Mahasiswa akan mempelajari teknik analisis data dari media jejaring sosial (twitter, facebook, blog, dll) untuk menghasilkan informasi terkait perilaku serta kebiasaan pengguna suatu komunitas dalam contoh permasalahan nyata. Hasil analisa berupa kuantitatif dan kualitatif meliputi ekstraksi topik diskusi, pengenalan mood dan sentimen (positif/ negatif) pengguna, pengukuran evaluasi efektivitas suatu program media jejaring sosial, hubungan antar pengguna dalam komunitas, eksplorasi hasil berbentuk grafik/ statistik/ tabel, dll. Informasi hasil analisa dapat dimanfaatkan sebagai umpan balik atau pertimbangan penyusunan suatu kebijakan/ pendukung keputusan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistic dan numeric secara efektif dan efisien;
- Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan berbagai konsep, teori, istilah dalam teknik analisis data dari media jejaring sosial
- Mahasiswa mampu melakukan pengumpulan data dari situs jejaring sosial
- Mahasiswa mampu melakukan analisa jejaring sosial menggunakan data set standar dengan kaskas bantu

- Mahasiswa mampu merancang dan mengimplementasikan analisa jejaring social pada suatu permasalahan nyata secara mandiri atau kerjasama tim

POKOK BAHASAN

- Pendahuluan, analisa jejaring sosial: konsep jenis jaringan berdasarkan teori graf (full, partial, atau egocentric network; unimodal, multimodal, atau affiliation network; multiplex network);
- Metrik analisa jaringan untuk pengukuran pengguna komunitas: aggregate, vertex-specific (degree, closeness, betweenness, eigenvector); analisa posisi terpenting (centrality, prestige), analisa relasi (structural balance, transitivity), analisa grup sosial (cohesive subgroups), analisa peran dan posisi (structural equivalence);
- Deteksi komunitas (node-centric, group-centric, network-centric, hierarchy-centric) dan evaluasi;
- Studi kasus analisis jaringan media sosial (email, threaded conversation, twitter, facebook, world wide web, flickr, youtube, wikis);
- Contoh pengaplikasian: perubahan pola pada media sosial, pengelompokan data jaringan sosial, rekomendasi dan analisa perilaku komunitas;
- Implementasi tahapan analisa media sosial mulai dari pengumpulan data sampai visualisasi hasil analisa secara mandiri atau kerjasama tim dengan dan atau tanpa open source library tertentu

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

- Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, “Social Media Mining: An Introduction”, Cambridge University Press, 2014
- Matthew A. Russell, “Mining the Social Web 2nded.”, O’Reilly, 2014
- Maksim Tsvetovat, Alexander Kouznetsov, “Social Network Analysis for Startups”, O’Reilly, 2011

MATA KULIAH	Nama MK	: Deep Learning
	Kode MK	: IF184958
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Dalam mata kuliah ini mahasiswa mempelajari teori, prinsip dan teknik pembelajaran “dalam” dan menerapkannya pada penyelesaian permasalahan real world yang mencakup pembelajaran moda tunggal, moda banyak, maupun model generative. Mahasiswa juga mempelajari bagaimana penerapan deep learning pada berbagai aplikasi, seperti klasifikasi citra, men-generate keterangan pada data citra/video/suara, translasi bahasa, men-generate model untuk keperluan simulasi/perencanaan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip sistem cerdas meliputi teknik representasi dan penalaran, teknik pencarian, agent, penggalian data, dan pembelajaran mesin, serta pengembangan aplikasi cerdas pada berbagai bidang, serta menguasai konsep dan prinsip-prinsip ilmu komputasi meliputi pengelolaan informasi, pengolahan data multimedia, dan analisis numerik;

Keterampilan Khusus:

Mampu merancang dan membangun aplikasi dengan menerapkan prinsip-prinsip sistem cerdas dan ilmu komputasi untuk menghasilkan produk aplikasi cerdas pada berbagai bidang;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu menjelaskan tentang teori, prinsip, dan berbagai model deep learning.
- Mahasiswa mampu menggunakan model deep learning yang sesuai untuk menyelesaikan berbagai permasalahan learning, seperti single modal learning, multimodal learning, dan generative model learning.
- Mahasiswa mampu membuat program untuk menyelesaikan suatu permasalahan real world menggunakan algoritma deep learning yang sesuai.
- Mahasiswa mampu melakukan riset mandiri pada topik tertentu, menulis laporan riset dengan ruang lingkup kecil, dan mempresentasikannya secara lisan.

- Mahasiswa mampu mengkritisi berbagai metode untuk memecahkan permasalahan real world menggunakan deep learning.

POKOK BAHASAN

- Pendahuluan: apa itu deep learning, perceptron, multi layer perceptron, algoritma training.
- Sequence Modeling with Neural Networks: recurrent neural networks, Application in machine translation, Training RNN.
- Deep Learning for Computer Vision: Image Classification Pipeline, Convolutional Neural Network, Object recognition, some applications: Image Caption Generation, Video Description Generation, Image Question Answering.
- Deep Generative Models: learn to understand data (image, audio, handwritten, language) through generation, compression as implicit generative modeling.
- Multimodal Learning: Flickr example (joint learning of images and tags), SoundNet (learning sound representation from videos), Image captioning (generating sentences from images).

PRASYARAT

Kecerdasan Komputasional

PUSTAKA

Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press Book, 2017.

MATA KULIAH	Nama MK	: Tata Kelola Teknologi Informasi
	Kode MK	: IF184964
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa akan mempelajari prinsip-prinsip dasar pada Tata Kelola Teknologi Informasi. Mata kuliah ini akan membahas pentingnya tata kelola teknologi informasi, kerangka kerja dalam tata kelola teknologi informasi termasuk tata kelola proyek, sumber daya manusia dan infrastruktur.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami pentingnya Tata Kelola TI
- Mahasiswa mampu menggunakan beberapa kerangka kerja untuk Tata Kelola TI
- Mahasiswa mampu menjelaskan tata kelola proyek dan sumber daya manusia
- Mahasiswa mampu menjelaskan tata kelola infrastruktur

POKOK BAHASAN

Manajemen Proses Bisnis, Manajemen Resiko, Kerangka Kerja Tata Kelola TI (COBIT & ITIL), Tata Kelola Proyek dan Manusia (SDM, Analisa Kebutuhan, Manajemen Proyek, Manajemen Perubahan), Tata Kelola Infrastruktur

PRASYARAT

Manajemen Basis Data, Analisa dan Perencanaan Sistem Informasi

PUSTAKA

Webber, L. and Wallace, M., *IT Governance: Policies and Procedures 2014* Edition, Wolters Kluwer, 201

MATA KULIAH	Nama MK	: Basis Data Terdistribui
	Kode MK	: IF184965
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Pada mata kuliah ini mahasiswa akan mempelajari prinsip-prinsip yang ada pada basis data terdistribusi. Topik-topik yang dibahas dalam basis data terdistribusi ini antara lain konsep basis data terdistribusi, arsitektur basis data terdistribusi, optimasi query, replikasi data, serta isu-isu terkini yang ada pada basis data terdistribusi economy.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami desain arsitektur basis data terdistribusi
- Mahasiswa memahami isu-isu penting yang ada di basis data terdistribusi (kontrol data dan akses, konkurensi, deadlock, replikasi data, dan manajemen transaksi) serta penyelesaiannya.
- Mahasiswa memahami dan mampu menerapkan optimasi di dalam basis data terdistribusi (optimasi query, parallel query, dekomposisi dan lokalisasi data).
- Mahasiswa mampu merancang dan mengimplementasikan solusi basis data terdistribusi untuk kasus nyata.

POKOK BAHASAN

- Mahasiswa memahami desain arsitektur basis data terdistribusi
- Mahasiswa memahami isu-isu penting yang ada di basis data terdistribusi (kontrol data dan akses, konkurensi, deadlock, replikasi data, dan manajemen transaksi) serta penyelesaiannya.
- Mahasiswa memahami dan mampu menerapkan optimasi di dalam basis data terdistribusi (optimasi query, parallel query, dekomposisi dan lokalisasi data).

- Mahasiswa mampu merancang dan mengimplementasikan solusi basis data terdistribusi untuk kasus nyata.

PRASYARAT

- Manajemen Basis Data

PUSTAKA

- M. T. Özsu and P. Valduriez, Principles of Distributed Database Systems, London: Springer, 2011.
- S. K. Rahimi and F. S. Haug, Distributed Database Management Systems: A Practical Approach, Hoboken, New Jersey: John Wiley & Sons, Inc., 2010

MATA KULIAH	Nama MK	: Sistem Informasi Geografis
	Kode MK	: IF184967
	Kredit	: 3 SKS
	Semester	: 7

DESKRIPSI MATA KULIAH

Sistem Informasi Geografis memberikan pemahaman konsep informasi geografi dibandingkan sistem informasi lainnya. Mahasiswa dibekali dengan pengetahuan khusus dibidang analisis data spasial-temporal, analisis permukaan 3-dimensi, sistem kordinat peta serta sistem proyeksi, membangun peta tematik dari gps tracking, serta pendekatan-pendekatan terbaru dalam pengembangan aplikasi yang terkait data geografis.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBAHKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

Mahasiswa mampu menggunakan perangkat lunak GIS standard industri serta open source. Sebagai project akhir kuliah ini, mahasiswa membuat inovasi-inovasi sesuai kebutuhan terkini seperti community-based-mapping, location-based-services, mobile-GIS

POKOK BAHASAN

- Map Projection and Coordinate System
- Map digitizing
- GPS
- Remote Sensing
- Thematic Map
- Spatial Analysis
- 3-D Analysis
- Community-Based Mapping
- Location-based Services

PRASYARAT

Pemrograman Berorientasi Objek

PUSTAKA

- Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., 2011, Geographic Information Systems and Science, New York, John Wiley & Sons.
- Narayan Panigrahi, Computing in Geographic Information System, CRC Press, 2014
- Quantum GIS, online resources (www.qgis.org)
- OpenStreetMap, online resources
- Google Map API, online resources

MATA KULIAH	Nama MK	: Pengantar Logika dan Pemrograman
	Kode MK	: IF184982
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa akan belajar mengenai pengantar logika dan dasar-dasar pemrograman seperti: algoritma sederhana, cara menuangkan algoritma, konsep percabangan, konsep perulangan, input, proses dan output, mengimplementasikan algoritma sesuai rumusan solusi.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

Pengetahuan:

- Menguasai prinsip dan teknik penyelesaian permasalahan dengan menggunakan: kalkulus, matriks, statistika, aproksimasi, optimasi liner, pemodelan dan simulasi;
- Menguasai prinsip-prinsip pembuatan suatu algoritma dan berbagai macam konsep bahasa pemrograman;

Keterampilan Khusus:

- Mampu menyelesaikan persoalan komputasi dan pemodelan matematis melalui pendekatan eksak, stokastik, probabilistik dan numerik secara efektif dan efisien;
- Mampu merancang dan menganalisa algoritma untuk menyelesaikan permasalahan secara efektif dan efisien berdasarkan kaidah-kaidah pemrograman yang kuat, serta mampu mengaplikasikan model-model pemrograman yang mendasari berbagai bahasa pemrograman yang ada,

serta mampu memilih bahasa pemrograman untuk menghasilkan aplikasi yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa memahami metodologi pengembangan software (analisa, design, coding, testing, dokumentasi) dan mampu menerapkan metodologi tersebut pada persoalan-persoalan sederhana.
- Mahasiswa mampu merancang program secara modular/terstruktur dengan pendekatan top-down menggunakan fungsi-fungsi.
- Mahasiswa mampu mengimplementasikan algoritma dengan benar
- Mahasiswa mampu melakukan proses debugging dan pengujian.
- Mahasiswa mampu berpikir komprehensif dalam merancang dan mengimplementasi program.
- Mahasiswa mampu berkomunikasi dan bekerja sama dalam sebuah tim melalui mekanisme dokumentasi program.
- Mahasiswa mampu menuangkan hasil pemikirannya dalam bahasa lisan maupun tulisan dengan baik.

POKOK BAHASAN

Konsep Pemrograman, definisi dan contoh algoritma, flowchart, Pemrograman dengan implementasi decision (tanpa iterasi): ekspresi, control flow, input & output; Variabel, assignment, perilaku dinamis variabel, debugging; Control flow dengan label (goto), Control flow dengan statement loop (while, for, break, continue), Tipe-tipe data primitif, sifat dan batas-batasnya, Konversi tipe, Array satu dimensi, String sebagai array char, Fungsi-fungsi input / output, Format; Operasi aritmetik, logika, bitwise, Hirarki operator, Konversi implisit dan casting, Permasalahan akurasi; Sorting: Bubble, Selection, linear search, konsep memory, tipe data pointer, aritmetika pointer, operator sizeof, alokasi memori dinamis; fungsi, parameter, return: tipe & perilakunya, rekursif; array multidimensi dengan definisi statis dan alokasi dinamis; routing pada labirin, tic-tac toe, operasi string, implementasi graph pada matriks 2 D, algoritma djikstra, Struct dan union, konsep file, fungsi-fungsi manipulasi, membuat aplikasi katalog, device grafik, fungsi-fungsi manipulasi grafik 2D, membuat gambar dengan komposisi bentuk-bentuk geometris dasar, membuat kurva dengan fungsi matematis, membuat kurva dengan fungsi parameter, membuat game atau editor.

PRASYARAT

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PUSTAKA

- Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.

MATA KULIAH	Nama MK	: Pengantar Teknologi Basis Data
	Kode MK	: IF184983
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH

Melalui mata kuliah ini, mahasiswa akan belajar tentang bagaimana memodelkan data dan informasi dalam bentuk diagram konsep dan diagram fisik serta menerapkannya ke dalam basis data dalam suatu DBMS menggunakan DDL. Mahasiswa juga belajar tentang konsep aljabar relasional dan DML serta penerapannya untuk mengelola data dan informasi dalam basis data. Mahasiswa juga belajar membuat aplikasi basis data untuk memanipulasi data dalam basis data. Perkuliahan dan praktek dilakukan di dalam kelas maupun laboratorium secara individual dan kelompok. Studi kasus yang digunakan dalam perkuliahan adalah studi

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBANKAN MATA KULIAH

Pengetahuan:

Menguasai konsep dan prinsip-prinsip penangkapan, pengolahan dan penyimpanan informasi dalam berbagai bentuk format;

Keterampilan Khusus:

Mampu mengumpulkan, mendigitalisasi, dan memproses data menjadi informasi baru yang bermanfaat dengan menggunakan pemodelan dan penyimpanan data yang efektif dan efisien;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memodelkan data dan informasi dalam bentuk diagram konsep dan diagram fisik serta menerapkannya ke dalam basis data dalam suatu DBMS, baik secara individual maupun kerja sama tim
- Mahasiswa mampu menerapkan konsep aljabar relasional, DDL, dan DML untuk mengelola data dan informasi dalam basis data

- Mahasiswa mampu membuat aplikasi basis data untuk memanipulasi data dalam basis data

POKOK BAHASAN

- **KONSEP DASAR MANAJEMEN INFORMASI:** perbedaan data, informasi dan pengetahuan ; manfaat data dan informasi untuk mendukung kebutuhan manusia; demonstrasi pemanfaatan data dan informasi bagi organisasi; identifikasi isu penggunaan data persisten pada organisasi; evaluasi penggunaan aplikasi skala kecil sampai menengah untuk memenuhi kebutuhan pengguna yang sesungguhnya.
- **SISTEM BASIS DATA:** karakteristik yang membedakan pendekatan database dengan pendekatan tradisional dengan pemrograman dengan file data; evolusi dan pendekatan sistem basis data; tujuan dasar, fungsi, model, komponen aplikasi dan impact social dari sistem basis data; identifikasi fungsi utama dari DBMS dan mendeskripsikan perannya dalam sistem basis data; konsep independensi data dan pentingnya dalam sistem basis data; penggunaan bahasa query deklaratif untuk mendapatkan informasi dari basis data;
- **PEMODELAN DATA:** kategori model data berdasarkan tipe konsep yang disediakan untuk mendeskripsikan struktur basis data (model data konsep, model data fisik, dan model data representasional), konsep pemodelan dan penggunaan notasi pemodelan (ERD, UML); model data relasional, prinsip dasar model data relasional, konsep pemodelan dan notasi dari model data relasional; konsep utama model OO seperti identity, tipe konstruktor, inheritance, polimorphisme, dan versioning; perbedaan model data relasional dengan model data semi terstruktur (DTD, XML Schema).
- **BASIS DATA RELASIONAL:** skema relasional dari model konseptual yang dibuat menggunakan model ER; perancangan database relasional; konsep batasan integritas dan batasan integritas referensial; penggunaan operasi aljabar relasional dari teori set matematika (union, intersection, difference, dan Cartesian product) dan operasi aljabar relasional untuk database (select (restrict), project, join, dan division); query dalam aljabar relasional dan tuple relational calculus; Ketergantungan fungsional antara dua atau lebih atribut yang merupakan subset relasi, Decomposition of a schema; lossless-join and dependency-preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued dependency (4NF), Join dependency (PJNF, 5NF), Representation theory
- **BAHASA QUERY:** bahasa database, SQL (DDL dan DML untuk mendefinisi struktur data, query, update, batasan-batasan, integritas); QBE dan 4th-generation environments, Nested Queries & Set

Comparison, Fungsi EXISTS & NOT EXISTS, Eksplisit Set & NULL, Penamaan Kembali, Fungsi Aggregate & Grouping, Substring Comparison, Arithmetic Operator & Ordering, VIEW dalam SQL • APLIKASI BASIS DATA
PRASYARAT
-
PUSTAKA
• Ramakrishnan, Raghu, Gehrke, Johannes. 2003. Database Management Systems, Third Edition. New York: The McGraw-Hill Companies, Inc. • Howe, David; Data analysis for Database Design, third Edition, Butterworth-Heineman, 2001

MATA KULIAH	Nama MK	: Pengantar Pengembangan Game
	Kode MK	: IF184985
	Kredit	: 3 SKS
	Semester	: 8

DESKRIPSI MATA KULIAH
Mata kuliah ini bertujuan agar mahasiswa mampu membuat sebuah game komputer berdasarkan teori-teori pendukung dasar pengembangan game. Pada awal mata kuliah ini mahasiswa akan mempelajari tentang sejarah pengembangan dan teknologi game, mengenal berbagai game populer yang ada serta klasifikasi berdasarkan genre dan klasifikasi lainnya. Tahap selanjutnya akan mempelajari bagaimana proses pengembangan game, bagaimana merancang desain game, membuat dokumentasi game (GDD), kemudian meningkatkan kualitas fun game dengan theory of fun, atau menambahkan edukasi dalam game. Hingga ada akhir kuliah mahasiswa bersama tim akan mampu mengimplementasikan pembuatan game.
CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH
Pengetahuan: Menguasai konsep dan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menguasai konsep dan prinsip-prinsip interaksi manusia dan computer;
Keterampilan Khusus: Mampu membangun aplikasi menggunakan prinsip-prinsip grafika komputer meliputi pemodelan, rendering, animasi dan visualisasi, serta menerapkan

prinsip-prinsip interaksi manusia dan komputer serta melakukan evaluasi ketepatangunaan untuk membangun aplikasi dengan antarmuka yang sesuai;

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu mengklasifikasikan game berdasarkan genre, tema dan rating.
- Mahasiswa mampu membuat dokumen desain game (Game Design Document)
- Mahasiswa mampu membentuk tim untuk pengembangan game serta membuat game yang memuat unsur-unsur dasar dengan atau tanpa bantuan middleware

POKOK BAHASAN

Teori dasar pengembangan game, proses pengembangan game, Game Design Document (GDD), game middleware, game edukasi, theory of fun.

PRASYARAT

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PUSTAKA

Arnest Adam, "Fundamentals of Game Design", New Riders Press, 2nd Edition 2010

SYLLABUS OF INFORMATICS (BACHELOR)

Study Program	Informatics
Educational Level	Bachelor

Expected Learning Outcome		
Attitude	1.1	Believing in the oneness of God and able to demonstrate religious attitude
	1.2	Upholding the value of humanity in undertaking the task based on religion, morality and ethics
	1.3	Contributing in improving the quality of community life, nation and state and the advance of civilization based on Pancasila
	1.4	Playing a role as a proud citizen who loves his/her homeland , having a nationalism and responsibility to the country and nation
	1.5	Appreciating the diversity of cultures, point of view, religion and belief as well as opinion or the original findings of others
	1.6	Working together, having social sensitivity and caring for community and environment
	1.7	Law abiding and disciplined in community and state life
	1.8	Internalizing values, norms and academic ethics
	1.9	Demonstrating attitude of responsibility on work in his/her field of expertise independently
	1.10	Internalizing spirit of independence, struggle and entrepreneurship
	1.11	Trying his/her best to achieve perfect results
	1.12	Working together to be able to make the most of his/her potential
General Skill	1.1	Being able to apply logical, critical, systematic and innovative thinking in the context of development or implementation of science and technology that concerns and implements the value of humanities in accordance with their area of expertise

Expected Learning Outcome		
	1.2	Being able to demonstrate independent performance, quality, and measurable
	1.3	Being able to examine the implications of the development or implementation of the science of technology which concerns and implements the value of humanities in accordance with its expertise based on rules, procedures and scientific ethics in order to produce solutions, ideas, designs or art criticism, compile scientific descriptions of the study results in the form of thesis or final project report , and uploaded it in the college page
	1.4	Arrange the scientific description of the results of the above study in the form of a thesis or final project report, and upload it on the college page
	1.5	Being able to take decisions appropriately in the context of problem solving in the area of expertise based on the results of information and data analysis
	1.6	Being able to maintain an expanded network with mentors, colleagues, colleagues both inside and outside the institution
	1.7	Being able to take responsibility for the achievement of group work and supervise and evaluate the work completion assigned to the worker under his/her responsibility
	1.8	Being able to conduct self-evaluation process to work group under his/her responsibility, and able to manage learning independently
	1.9	Being able to document, store, secure and recover data to ensure validity and prevent plagiarism
	1.10	Being able to develop themselves and compete in national and international level
	1.11	Being able to implement sustainability principles and develop knowledge
	1.12	Being able to implement information and communication technology (ICT) in the context of implementation of his/her work
	1.13	Being able to apply entrepreneurship and understand technology-based entrepreneurship
Knowledge	1.1	Mastering concept and principles of Intelligent System such as representation and reasoning techniques,

Expected Learning Outcome		
		searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
	1.2	Mastering concept and theory of architecture, system and network computer principles based on logic
	1.3	Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
	1.4	Mastering the concepts and principles of: - design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient; - making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.
	1.5	Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.
	1.6	Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
	1.7	Mastering concepts and principles of collecting, processing and storing the information in various formats
	1.8	Mastering principles of algorithm development and various programming language concepts

Expected Learning Outcome		
Specific Skill	1.1	Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
	1.2	Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient
	1.3	Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields
	1.4	Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities
	1.5	Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.
	1.6	Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
	1.7	Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners
	1.8	Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LIST OF BACHELOR PROGRAM

No	Course Code	Course Name	Credit
SEMESTER: 1			
1	UG184911	Pancasila	2
2	UG184912	Bahasa Indonesia	2
3	KM184101	Math 1	3
4	SF184101	Physics 1	4
5	SK184101	Chemistry	3
6	IF184101	Programming Fundamental	4
		Total Credits	18
SEMESTER: 2			
1	UG184914	English	2
2	UG18490X	Religion	2
3	UG184913	Kewarganegaraan	2
4	KM184201	Math 2	3
5	SF184202	Physics 2	3
6	IF184201	Digital System	3
7	IF184202	Data Structure	3
		Total Credits	18
SEMESTER: 3			
1	IF184301	Object Oriented Programming	3
2	IF184302	Linear Algebra	3
3	IF184303	Numerical Computation	3
4	IF184304	Discrete Mathematics	3
5	IF184305	Computer Organization	3
6	IW184301	Database System	4
		Total Credits	19
SEMESTER: 4			
1	IF184401	Design and Analysis Algorithms	4
2	IF184402	Operating System	4
3	IF184403	Artificial Intelligence	3
4	IF184404	Database Management	3
5	IF184405	Probabilistic and Statistic	3
6	IF184406	Analysis and Design of Information Systems	3
		Total Credits	20

No	Course Code	Course Name	Credit
SEMESTER: 5			
1	IF184501	Software Design	3
2	IF184502	Computer Graphics	3
3	IF184503	Computational Intelligence	3
4	IF184504	Web Programming	3
5	IF184505	Computer Network	4
6	IF184506	Software Project Management	3
		Total Credits	19
SEMESTER: 6			
1	IF184601	Human and Computer Interaction	3
2	IF184602	Network Programming	3
3	IF184603	Requirement Engineering	3
4	IF184604	Graph Theory and Automata	3
5	IF184605	Framework-based Programming	3
6		Elective Course 1	3
		Total Credits	18
SEMESTER: 7			
1	UG184915	Technopreneurship	2
2	IF184701	Information and Network Security	3
3	IF184702	Undergraduate Pre-Thesis	3
4		Elective Course 2	3
5		Elective Course 3	3
6		Elective Course 4	3
		Total Credits	17
SEMESTER: 8			
1	IF184801	Internship	2
2	IF184802	Undergraduate Thesis	4
3	UG184916	Scientific and Application Technology	3
4		Course for Specific Purpose	3
5		Elective Course 5	3
		Total Credits	15

LIST OF ELECTIVE COURSES

No	Course Code	Course Name	Credit
1	IF184901	Mobile Device Programming	3
2	IF184902	Development of Analysis Algorithms	3
3	IF184903	Interface Programming	3
4	IF184911	Wireless Networking	3
5	IF184912	Internetworking Technology	3
6	IF184913	Security Design Of System And Network	3
7	IF184914	IoT Technology	3
8	IF184921	Modeling & Simulation	3
9	IF184922	Multivariate Data Analysis	3
10	IF184923	Operational Research	3
11	IF184931	Game Development Techniques	3
12	IF184932	Virtual and Augmented Reality	3
13	IF184933	Game System	3
14	IF184934	Computer Animation and 3D Modeling	3
15	IF184935	Smart Game	3
16	IF184941	Multimedia Network	3
17	IF184942	Cloud Computing	3
18	IF184943	Mobile Computing	3
19	IF184944	Distributed System	3
20	IF184945	Digital Forensic	3
21	IF184946	Grid and Paralel Computing	3
22	IF184947	Pervasive Computing and Sensor Network	3
23	IF184948	Data Compression	3
24	IF184951	Data Mining	3
25	IF184952	Digital Image Processing	3
26	IF184953	Biomedical Computing	3
27	IF184954	Robotics	3
28	IF184955	Information Retrieval	3
29	IF184956	Computer Vision	3
30	IF184957	Social Network Analysis	3
31	IF184958	Deep Learning	3
32	IF184961	Enterprise Systems	3
33	IF184962	Knowledge Engineering	3
34	IF184963	Systems Audit	3
35	IF184964	Information Technology Governance	3
36	IF184965	Distributed Databases	3

No	Course Code	Course Name	Credit
37	IF184966	Big Data	3
38	IF184967	Geographic Information System	3
39	IF184971	Software Architecture	3
40	IF184972	Software Quality Assurance	3
41	IF184973	Software Evolution	3
42	IF184974	Software Construction	3
43	IF184981	Specific Topics	3
44	IF184982*	Introduction to Programming and Logic	3
45	IF184983*	Introduction to Database Technology	3
46	IF184984*	Introduction to Process Mining	3
47	IF184985*	Introduction to Game Development	3
48	IF184986*	Introduction to Intelligent System	3

COURSE	Course Name : Programming Fundamental
	Course Code : IF184941
	Credit : 4 SKS
	Semester : 1

DESCRIPTION of COURSE

In this course, students learn the fundamental of structured programming using C language. The fundamental of structured programming including: basic problem solving using computer approach, the basic of algorithm, and implement an algorithm using computer language, step of input-process-output, branching and looping, including their nested structures, modularity, passing parameters, recursive structure, struct, string and array data structure, handle file as input and output

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts ;

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

- Students capable to understand and capable to implement software development methodology
- Students capable to design structured computer program using functions
- Students capable to implement algorithm using C programming language
- Students capable to communicate and working in team
- Students capable to express ideas in verbal and written

MAIN SUBJECT	
The concept of algorithms and computer programming such as: Program flowchart, standard and documentation, Application development using C language compiler, Input-process-output and data types, type cast and conversion, Control flows and their implementation example, String and array, Function, passing arguments/parameters and modularity, Recursive structure, Data Structure using Struct in C, File I/O, Using graphical and other libraries, Program testing, debugging and documentation.	
PREREQUISITES	
-	
REFERENCE	
- Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012. - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.	

COURSE	Course Name : Digital System
	Course Code : F184201
	Credit : 3 SKS
	Semester : 2

DESCRIPTION of COURSE	
This course explains number systems, describes Boolean function of digital systems and its simplification using some methods, and explains the function and characteristic of digital system components. It also analyses and designs digital systems, both combinational and sequential systems.	
LEARNING OUTCOMES	
Knowledge: Mastering concept and theory of architecture, system and network computer principles based on logic ;	
Specific Skill: Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient	
COURSE LEARNING OUTCOMES	

Students capable of analysing and designing digital system either combinational as well as sequential circuits.

MAIN SUBJECT

- Number System: Explanation between analog and digital system. Number systems: binary, octal, decimal, hexadecimal, conversion between number system. Coding: 8-4-2-1, BCD, Excess-3, Gray, dan others.
- Boolean Algebra and simplification of Boolean function: Logic Gate: OR, AND, NOT, XOR, NAND. Truth table, logic function and its implementation using gates. SOP and POS form. Simplification using Boolean algebra & De Morgan theory. Simplification using K-map and Tabulation method.
- Combinational Circuit: Adder, Subtractor, Decoder, Encoder, Multiplexer, Demultiplexer. Design combinational circuit.
- Synchronous Sequential Logic: Basic concept of synchronous sequential circuit, SR Latch. SR, JK, D, and T Flip-Flops, State Diagram, Sequential circuit analysis, design using flip-flops.
- Register, Counter and Memory: Register, Register with Parallel Load, Shift Register, Counter, Binary Up-Down Counter, Memory Decoding, memory design, Error Correction, ROM.
- Algorithmic State Machine (ASM): ASM Chart, ASM Block, Timing Sequence, Circuit design using ASM Chart.
- Asynchronous Sequential Logic (ASL): Basic concept of ASL, Transition Table, Flow Table, Race Condition. Example of ASL circuit design, simplification of State and Flow Table.

PREREQUISITES

-

REFERENCE

- Morris Mano & Ciletti M., Digital Design (5th Edition), Prentice-Hall, 2012
- Ronald J. Tocci, Neal S. Widmer, Digital Systems Principles and Applications (11th Edition), Prentice-Hall, 2010
- Supeno Djanali, dkk: Bahan Ajar Sistem Digital : e-Learning:SHARE-ITS, <http://share.its.ac.id>, 2012

COURSE	Course Name : Data Structure
	Course Code : IF184202
	Credit : 3 SKS
	Semester : 2

DESCRIPTION of COURSE

The students will learn several structures and related algorithms to organize (store, arrange, order) a data collection in a computer so that it can be used efficiently. Data abstraction is discussed in order to define a particular data structure (linear or non linear) with some examples. Lab works with C/C++ programming language are set to implement appropriate data structure in some problem solvings

LEARNING OUTCOMES

Knowledge:

Mastering principles of algorithm development and various programming language concepts

Specific Skill:

Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand and capable to implement stack, queue, linked-list, hash-table, tree and graph data structure. Students are also able to implement algorithm for accessing those data structure.

MAIN SUBJECT

- Abstract data type: introduction; concepts of storing, arranging and ordering data in linear/non-linear approaches;
- Linear data structure (stack, queue): push-pop functions in a stack; enqueue-dequeue functions in a queue; empty, full, and top functions for checking the contents of a structure; implementations of stack and queue with array, linked-list and STL for problem solving;
- Non-linear data structure - tree: functions for insertion, deletion, and searching nodes in a tree; binary search tree; graph; traversing algorithms in tree and graph; implementations of tree and graph with array, linked-list and STL for problem solving;

- Sorting algorithms (selection, insertion, bubble, quick, merge) and searching algorithms (binary, hashing) for storing, arranging and ordering data; analysis of algorithms;
- Hash table data structure

PREREQUISITES

Programming Fundamental

REFERENCE

- Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++ 4ed”, Addison-Wesley, New Jersey, 2014
- Robert Sedgewick, Philippe Flajolet, “An Introduction to the Analysis of Algorithms 2ed”, Addison-Wesley, New Jersey, 2013

COURSE	Course Name : Computer Organization
	Course Code : IF184305
	Credit : 3 SKS
	Semester : 3

DESCRIPTION of COURSE

This course explains the basic operation of computer and its components and the sequence of execution of instruction. It also explain the organization and function of each component as well as the the concept of pipelining as one type of parallel processing.

LEARNING OUTCOMES

Knowledge:

Mastering concept and theory of architecture, system and network computer principles based on logic

Specific Skill:

Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient

COURSE LEARNING OUTCOMES

Students capable of explaining all aspects of computer organization.

MAIN SUBJECT

- Basic Computer Structure: computer architecture and organization, computer sructure and and its internal functions, evolution and computer generations.
- Machine Instructions and Program: Memory address and location, basic memory operation, instruction and its sequence of execution, addressing modes, assembly language, stack & queue, subroutines, examples of some instruction sets.
- Input/Output Organization: Input/Output organization, I/O access, interrupt, Direct Memory Acces, standard I/O interface.
- Memory System: Basic concept of memory system, Random Access Memory (RAM), Read Only Memory (ROM), Cache Memory: Mapping, Replacement Algorithm, Virtual Memory, Secondary Storage.
- Arithmetics: add and subtract, Fast Adder, multiplication of positive numbers, multiplication of sign numbers, Booth algorithm, Fast Multiplication, division of integer numbers, real number and its operation.

- Processing Unit: Basic concept of processing unit, execution of the whole instruction, multiple bus organization, Hardwired Control, Multiprogrammed Control.
- Pipelining: Basic concept of pipelining, data & instruction hazard, Superscalar operation.

PREREQUISITES

Digital System

REFERENCE

- Supeno Djanali & Baskoro Adi P., *Organisasi Komputer*, ITS Press, 2012
- Hamacher, Vranesic & Zaky, *Computer Organization and Embedded Systems (6th Edition)*, McGraw-Hill, 2011.
- William Stallings, *Computer Organization and Architecture (9th Edition)*, Prentice-Hall, 2012.
- Morris Mano, *Computer System Architecture (3rd Edition)*, Prentice-Hall, 1993.

COURSE	Course Name : Object Oriented Programming
	Course Code : IF184301
	Credit : 3 SKS
	Semester : 3

DESCRIPTION of COURSE

In this course students will learn how to model programming problem using object oriented concepts. The object oriented programming concepts are class concept, inheritance, overriding, overloading, polymorphism, abstract class interface, and object life cycle in computer memory. In this course students will be introduced with standard library in object oriented language (collections, iterator, GUI) and encouraged to build a reliable program.

LEARNING OUTCOMES

Knowledge:

Mastering principles of algorithm development and various programming language concepts

Specific Skill:

Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand the difference between object-oriented programming and procedural programming. Students understand and are able to implement concept of class, inheritance, overriding, overloading, abstract class, interface, collections, thread, iterator, library and GUI.

MAIN SUBJECT

- Procedural concept and the problems.
- Class concept (fields, methods, constructors), and object (state and behavior).
- Class diagram modelling.
- Inheritance, overriding, sub class.
- Dynamic dispatch: definition of method-call.
- Polymorphism, upcasting and downcasting.
- Abstract class, interface

- Object lifetime: constructor, destructor, finalizer, memory management (heap and stack, garbage collection).
- Standard library in object oriented programming language: collection, iterator, multithreading, GUI (Graphical User Interface).
- Exception handling

PREREQUISITES

Data Structure

REFERENCE

- Deitel, P., & Deitel, H. (2011). C++ How to Program (8th Edition). Prentice Hall.
- Lippman, S. B., Lajoie, J., & Moo, B. E. (2012). C++ Primer (5th Edition). Addison-Wesley Professional.
- McConnell, S. (2004). Code Complete: A Practical Handbook of Software Construction, Second Edition (2nd edition). Microsoft Press.
- Gamma, E., Helm, R., Johnson, R., & Vlissides, J. (1994). Design Patterns: Elements of Reusable Object-Oriented Software (1st edition). Addison-Wesley Professional.

COURSE	Course Name : Linier Aljebra
	Course Code : IF184302
	Credit : 3 SKS
	Semester : 3

DESCRIPTION of COURSE

In this course, students learn how to solve the system linear equations (SLE) problem using computational matrix. SLE can be done using Gaussian elimination, Gauss-Jordan elimination and Cramer's rules. In order to better understand the material for the students, it needs to be implemented into a particular programming language. Matrix operation problem begins with determinant and continues with inverse matrix. The determinant can be done using Elementary Row Operations (ERO) and cofactor. Invers matrix can be done using ERO, cofactors and Pseudo-inverse. Implementation to the program are also required to make students more proficient. In vector space, students learn field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. Basis include spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram schmidt. Next is about eigenvalues, student learn about eigenvalue and eigenvector, diagonalization, orthogonal diagonalization (practice using the program). In order to further explore the material, case examples of linear algebra will give.

LEARNING OUTCOMES

Knowledge:

Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation

Specific Skill:

Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently

COURSE LEARNING OUTCOMES

- Students are able to solve the system linear equations (SLE) problem using computational matrix.
- Students are able to solve Matrix operation problem and Pseudo-inverse.
- Students are able to solve vector space problem.

- Students are able to solve basis problem.
- Students are able to solve eigen problem.
- Students are able to implementation SLE, matrix and basis into the program.
- Students are able to apply linear algebra in some cases.

MAIN SUBJECT

System Linear Equations; Gaussian elimination, Gauss-Jordan elimination and Cramer's rules (using program). Matrix and operation, Determinant, determinant using Elementary Row Operations (ERO) and cofactor. Invers matrix using ERO, cofactors and Pseudo-inverse. Vector Space; field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. Basis; spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram schmidt. Eigenvalue dan eigenvektor; eigenvalue dan eigenvektor, diagonalization, ortogonal diagonalization (using program). Case example in linier algebra.

PREREQUISITES

Math 2

REFERENCE

- Elementary Linear Algebra ; Howard Anton, Drexel University, John Wiley & Sons, Inc; ninth edition, 2005
- Elementary Linear Algebra - applications version; Howard Anton, Chris Rorres; John Wiley & Sons, Inc; ninth edition, 2005

COURSE	Course Name : Numerical Computation
	Course Code : IF184303
	Credit : 3 SKS
	Semester : 3

DESCRIPTION of COURSE

The course of numerical computation will give the comprehensive knowledge dan skill of computation for many numerical problems. Students will give many exercises which can improve their analysis skill to solve any numerical problem, including to find fine approximation value for appropriate problems using several methods.

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

- The students being able to understanding significant figures, round-off errors, and Taylor series
- The students being able to using several methods to finding roots of equation
- The students being able to using several methods for curve fitting with regression and interpolation techniques
- The students being able to using several numerical methods for finding approximation value for finite-difference
- The students being able to using several numerical methods for finding integration value
- The students being able to using several numerical methods for finding the value of differentiation of function with single free's variable

(ordinary differential equation) or more variables (partially differential equation)

MAIN SUBJECT

- Introduction to Numerical Computation Bilangan Berarti
 - Significant Figures
 - Errors Definition
 - Round-off Errors
 - Taylor Series
- Root of Equation: Bracketing (Akolade) Methods
 - Graphical Method
 - Table Method
 - Bolzano Method
 - False Position Method
 - Factorization Method
 - Quotient-Difference Method
- Root of Equation: Open Methods
 - Iteration Method
 - Newton-Raphson Method
 - Secant Method
 - Brent's Method
 - Multiple Roots
- Roots of Polynomial
 - Polynomials in Engineering and Science
 - Muller's Method
 - Bairstow's Method
- Curve Fitting: Least-Squares Regression
 - Linear Regression
 - Polynomial Regression
- Curve Fitting: Interpolation
 - Finite-Difference
 - Interpolasi Newton-Gregory
 - Interpolasi Gauss
 - Interpolasi Lagrange
 - Interpolasi Hermite
- Diferensiasi Beda-Hingga
 - Newton-Gregory Interpolation
 - Gauss Interpolation
 - Lagrange Interpolation
 - Hermite Interpolation
- Numerical Integration
 - Trapezioda Method

- Simpson Method
- Kuadratur Method
- Rhomberg Method
- Ordinary Differential Equation (ODE)
 - Euler-Cauchy Method
 - Heun Method
 - Picard Method
 - Taylor Method
 - Runge-Kutta Method
 - Adam Method
 - Milne Method
 - Adam-Moulton Method
- Partially Differential Equation (PDE)
 - Elliptical PDE
 - Parabolic PDE
 - Hiperbolic PDE

PREREQUISITES

Math 2

REFERENCE

- Chapra, S.C., Canale, R.P., "Numerical Methods for Engineers 6th Ed", McGraw-Hill, 2010
- Hariadi, V., "Bahan Ajar Komputasi Numerik", 2014

COURSE	Course Name : Discrete Mathematics
	Course Code : IF184304
	Credit : 3 SKS
	Semester : 3

DESCRIPTION of COURSE

In this course, students will learn the concept of logic, methods of proof, which includes a set of discrete structures, functions and relations, the concept of counting, and recursive. The purpose of this course is the student able to explain the concepts of logic, methods of proof, sets, functions, mathematical induction and recursion, relationship and apply them to the real problems, both with the performance of individuals and in groups in teamwork. This course is a prerequisite for the course Linear Algebra, Design and Analysis of Algorithm I, Graph Theory, Statistics, and Automata.

LEARNING OUTCOMES

Knowledge:

Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation

Specific Skill:

Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently

COURSE LEARNING OUTCOMES

Students capable to explain and apply logic concepts and inference, inference methods, concept of Set and Function, recursive and relation concept

MAIN SUBJECT

- **BASIC CONCEPTS OF LOGIC:** Concepts and equivalence proposition logic, predicates and quantifiers concept, the use of quantifiers in the proposition, and the concept of the rule of determining conclusions.
- **METHODS BASIC CONCEPTS OF EVIDENCE:** The concept of proof methods such as direct evidence, proof by contraposition, proof by contradiction.
- **BASIC CONCEPTS DISCRETE STRUCTURES:** Definition of the set, the operation on the set, the concept of function, the concept of a relation, equivalence relation, partial ordering.
- **METHOD OF EVIDENCE WITH INDUCTION AND recursion:** The concept of mathematical induction, the concept of strong induction, the

method of proof by strong induction and well ordering, recursive definitions, structural induction.

- BASIC CONCEPT OF CALCULATION: Basic counting, Pigeonhole principle, permutations and combinations, binomial coefficients and Identity, recurrent relations and its applications, solutions recurrent relations.

PREREQUISITES

-

REFERENCE

- Kenneth H. Rosen, "Discrete Mathematics and its Applications 7th edition", McGraw Hill Incorporated, New York, 2012.
- Andrew Simpson, "Discrete Mathematics by Example", McGraw-Hill Incorporated, New York, 2002.
- Norman L. Biggs, "Discrete Mathematics", Oxford University Press, 2002.

COURSE	Course Name : Database System
	Course Code : IW184301
	Credit : 4 SKS
	Semester : 3

DESCRIPTION of COURSE

Through this course, students will learn about how to model data and information in the form of charts and diagrams concept of physical and apply it to the database in a DBMS using DDL. Students also learn about the concept of relational algebra and data manipulation language (DML) and its application to manage data and information in a database. Students also learn to create database applications to manipulate data in the database. Concepts and practice is done in the classroom and laboratory individual and group. Case studies are used in lectures is a real

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students are able to model data and information in the form of conceptual diagram and physical diagram. And according to the model, students are able to create relational database in a DBMS, able to implement the DDL, DML adn query.

MAIN SUBJECT

- **BASIC CONCEPTS OF INFORMATION MANAGEMENT:** differences in the data, information and knowledge ; benefit from data and information to support human needs; demonstration of the use of data and information for the organization; identification of issues persistent data usage in organizations; evaluation of the use of small to medium scale applications to meet the real needs of users.
- **DATABASE SYSTEMS:** characteristics that distinguish the database approach with traditional approaches to programming with data files; evolution of database and systems approach; the basic purpose, function model, application components and social impact from database systems

; identification of the main function from DBMS and describing its role in the system database; concept of data independence and importance in the database systems; the use of declarative query language to obtain information from databases;

- DATA MODELLING: categories based on the type of concept data model is provided to describe the structure of the database (concept data model, physical data model, and representational data model), modeling concepts and the use of modeling notation (ERD, UML); relational data model, the basic principles of the relational data model, modeling concepts and notation of the relational data model; The main concept of OO model such as identity, type constructor, inheritance, polymorphism, and versioning; differences in relational data model with semi-structured data model (DTD, XML Schema).
- RELASIONAL DATABASE: relational schema from conceptual model created using the model er; relational database design; the concept of integrity constraints and referential integrity constraints; the use of relational algebra operations from mathematical set theory (union, intersection, difference, and Cartesian product) and relational algebra operations to database (select, restrict, project, join, and division); query in the tuple relational algebra and relational calculus; Functional dependence between two or more attributes that are a subset relations, Decomposition of a schema; lossless-join and dependency-preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued dependency (4NF), Join dependency (PJNF, 5NF), Representation theory
- BAHASA QUERY: bahasa database, SQL (DDL dan DML untuk mendefinisi struktur data, query, update, batasan-batasan, integritas); QBE dan 4th-generation environments, Nested Queries & Set Comparison. Fungsi EXISTS & NOT EXISTS, Eksplisit Set & NULL, Penamaan Kembali, Fungsi Aggregate & Grouping, Substring Comparison, Arithmetic Operator & Ordering, VIEW dalam SQL
- DATABASE APPLICATION

PREREQUISITES

Data Structure

REFERENCE

- Ramakrishnan, Raghu, Gehrke, Johannes. 2003. Database Management Systems, Third Edition. New York: The McGraw-Hill Companies, Inc.
- Howe, David; Data analysis for Database Design, third Edition, Butterworth-Heinemann, 2001

COURSE	Course Name : Operating System
	Course Code : IF184402
	Credit : 4 SKS
	Semester : 4

DESCRIPTION of COURSE

In computing and its applications, Operating systems have important role in managing basic computing resources such as I/O and its peripheral, memory and processor. This course discuss the design and principles of the operating systems managing the computing resource in a computer.

LEARNING OUTCOMES

Knowledge:

Mastering concept and theory of architecture, system and network computer principles based on logic

Specific Skill:

Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient

COURSE LEARNING OUTCOMES

Students understand and able to explain the basic concept of operating system. Students are able to implement the communication between process and able to synchronise multiprocess and multithread, and able to implement process scheduling, I/O operation and File System.

MAIN SUBJECT

- The basic concept of operating systems, process life cycle, interprocess communication.
- Multiprocess synchronization mechanism and the multithread
- Memory management, page replacement, paging and segmentation algorithm.
- Process scheduling and its algorithm
- Relationship and connectivity between I/O hardwares and I/O softwares.
- Potential attack types in the operating systems as well as its security measures.

PREREQUISITES

Computer Organization

REFERENCE

William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall.

COURSE	Course Name : Design and Analysis Algorithms
	Course Code : IF184401
	Credit : 4 SKS
	Semester : 4

DESCRIPTION of COURSE

In this course, students will learn about design and algorithm analysis in programming. The concepts that will be discussed including algorithm complexity calculation in asymptotic notation, analyze the correctness of algorithm using loop invariant from iterative and divide-conquer algorithm. Students are also expected able to explain the strategy and design of algorithm, and implement them to solve programming problems.

LEARNING OUTCOMES

Knowledge:

Mastering principles of algorithm development and various programming language concepts;

Specific Skill:

Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand and able to analyse the performance of an algorithm, and able to design and implement iterative, recursive and divide-and-conquer algorithm

MAIN SUBJECT

- Algorithm definition, problem solving fundamental algorithmically, main problem definition, data structure reviews
- Asymptotic notation, basic notation, general functions.
- Recursive and non-recursive algorithms analysis (master theorem)

PREREQUISITES

Data Structure

REFERENCE

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms Third Edition", MIT Press, 2009
- Levitin, Anany, "Introduction to The Design & Analysis Af algorithms 3rd ed", Addison-Wesley, 2012

COURSE	Course Name : Probability and Statistics
	Course Code : IF184405
	Credit : 3 SKS
	Semester : 4

DESCRIPTION of COURSE

In this course, students will learn about Sample Space, Event Space, Probability Axioma, and Probability Formula, Conditional Probability, Bayesian Theory, Random Variable, Discrete and Continue Probabability, Expectation, Sampling Distribution, Estimation, Hypothesis Testing, Analysis of Variance and Principle Component Analysis.

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

- Students can explain about fundamentals of Statistics in relation to the data analysis.
- Students can make a model of the probability of an event of a random experiment.
- Students can model the random experiment with Bayesian theorem approach.
- Students can model the random experiment using random variable approach.
- Students can calculate the probability of discrete and continuous random variables with a variety of special distributions.
- Students can explain the concept of expectation, variance, covariance and correlation.

- Students can explain the concept of probability distributions approach and Chebyshev theorem.
- Students have an ability to estimate parameter using samples.
- Students can calculate the estimators of the population parameters and make a conclusions.
- Students can perform a hypothesis test of the population parameters and make a conclusions.
- Students can create an ANOVA model.
- Students can apply the orthogonal experimental design to analyze the influence of multiple factors.
- Students can create a model of PCA to reduce the dimension of data.

MAIN SUBJECT

Sample Space, Event Space, Probability Axioma, and Probability Formula, Conditional Probability, Bayesian Theory, Random Variable, Discrete and Continue Probabability, Expectation, Sampling Distribution, Estimation, Hypothesis Testing, Analysis of Variance and Principle Component Analysis.

PREREQUISITES

Discrete Mathematics

REFERENCE

- Ronald E.Walpole, Raymond H.Myers, “Probability & Statistics for Engineers & Scientists”, 9th Edition, Prentice-Hall Inc., 2010.
- Michael Baron, “Probability & Statistics for Computer Scientists”, Chapman & Hall, 2007.
- Sheldon Ross, “A First Course in Probability”, Prentice Hall, 9th Edition, 2012.

COURSE	Course Name : Artificial Intelligence
	Course Code : IF184403
	Credit : 3 SKS
	Semester : 4

DESCRIPTION of COURSE

In this course, students will learn about intelligent agent both theoretical in class and practical through project task. Intelligent agent will use searching algorithms, knowledge-based algorithms and learning-based algorithms. Searching algorithms include uninformed/informed search algorithm, heuristic search, adversarial search and searching algorithm for constraint satisfaction problem. Knowledge-based algorithms include representation and inference propositional logic, first order logic, reasoning under uncertainty. Learning-based algorithms will be discussed about statistical learning algorithm. Beside theory, in this course will be delivered some case studies through project tasks related to intelligent agent by using searching algorithm, knowledge-based algorithms or statistical learning algorithm. Project tasks can be done individually and team work. Therefore, students have learning experience and able to think critically about the intelligent agent applications.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to comprehend concepts of artificial intelligence, intelligent agent and identify the problems that can be solved by using intelligent agent
- Students are able to explain, identify, design and apply the intelligent agent by using searching algorithm including uninformed search, informed search, heuristic search, adversarial search and searching algorithm for Constraint Satisfaction Problem

- Students are able to explain, design and apply knowledge-based intelligent agent representing from knowledge-based to propositional logic or first order logic and use resolution algorithm, forward and backward chaining to process the inference.
- Students are able to explain, design and apply the first order logic to represent the action aspect, space, time dan mental event using ontology and appropriate reasoning.
- Students are able to explain, design and apply the intelligent agent for the problem that exists in uncertain condition using bayesian network and probabilistic reasoning.
- Students are able to explain, design and apply the intelligent agent using statistical learning algorithm.

MAIN SUBJECT

Concepts of Artificial Intelligence, Intelligent Agent, Searching Algorithms (uninformed search, informed search, heuristic search, adversarial search and searching algorithm for Constraint Satisfaction Problem), Representation and Inference (resolution, forward-chaining and backward chaining) Propositional Logic and First Order Logic, Reasoning under Uncertainty and Statistical Learning (Bayesian learning, maximum a posteriori approximation (MAP), maximum likelihood approximation, parameter learning, naïve bayes model, parameter learning, EM algorithm, log-likelihood function, hidden markov model, maximization, miss data, E-step, M-step, mixed attributes example)

PREREQUISITES

Data Structure

REFERENCE

- Russel & Norvig, Artificial Intelligence : A Modern Approach
- R.O. Duda, P.E.Hart, D.G.Stork, Pattern Classification, John Wiley & Sons, Inc., 2001
- Amit Konar, Computational Intelligence, Springer, 2005.
- C. H. Bishop, Pattern Recognition and Machine Learning, Springer Science, 2006

COURSE	Course Name : Database Management
	Course Code : IF184404
	Credit : 3 SKS
	Semester : 4

DESCRIPTION of COURSE

Students will learn about modeling of complex systems in industry based on business process. According to the reference model, students will implement and manage an optimal SQL database. Lectures are presented in classroom and students will work on small project as a practice. The aim of this course is to provide experience to students about managing and handling problems when working in large-scale data. This course will cover distributed database and data warehouse as well.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students are able to implement database and how to handle big data.

MAIN SUBJECT

Modeling of Complex Systems: specific case studies in the field of industri. SQL Programming: triggers, stored procedures, functions, view. Index: B + Tree, Bitmap, Hash, and Unclustered Clustered indexes. Optimization database: design optimization, administrative tuning. SQL Transaction Processing: transaction, failure and recovery, and concurrency control. XML in the database. Distributed database. Data warehouse.

PREREQUISITES

Database System

REFERENCE

- Avi Silberschatz, “Database System Concepts”, 5th edition, 2002.
- Morgan Kaufman, “Advanced Database System”, Morgan Kaufman Publisher Inc., 1993.
- Howe, David, “Data Analysis for Database Design”, 3th edition. Butterworth-Heineman, 2001.

- Ramakrishnan, Raghu, Gehrke, Johannes. “Database Management Systems”, 3th ed., New York: The McGraw-Hill Companies Inc., 2003.

COURSE	Course Name : Analysis and Design of Information Systems
	Course Code : IF184406
	Credit : 3 SKS
	Semester : 4

DESCRIPTION of COURSE

In this course, students will analyze systems according to requirements definition, techniques to obtain requirements and requirements analysis strategy. Students will model the requirements using the notations that are generated using methods and tools such as Data Flow Diagram (DFD), Data Dictionary, Unified Modeling Language (Object), Functional Decomposition Diagram (FDD), Entity Relationship Diagram (ERD). Students will transform the analysis result into design of software architecture, user interface, source code and data storage.

LEARNING OUTCOMES

Knowledge:

- Mastering the concepts and principles of:
 - Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
 - Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.
- Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

- Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities
- Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand the role of system analyst, understand the development of Information System, and understand the business process and user requirements. Then, students are able to model the process, data and object.

Finally, studenta should be able to design the architecture, user interface, report, program and data storage.

MAIN SUBJECT

- System Analyst and Development of Information Systems: System Analyst (Competency and role). Development of information systems, Software development life cycle (Planning, Analysis, Design and Implementation). Identification and initialization of Information Systems Project, Feasibility Analysis Project (Technique, Economy and organization).
- Analysis Phase: Requirement establish (understand business process, issues domain, organizations, and stakeholder). Technique to get requirement (Interview, questioners, Observation, document analysis, selecting appropriate technique). Strategic to do analysis requirement (Problem analysis, root course analysis, activity based costing).
- Requirement Modeling: Process modeling (Data Flow Diagram, Data Dictionary, Functional Decomposition Diagrams). Data Modeling (Entity Relationship Diagram/ Conceptual Data Model). Object Model (Use Case Diagram, Activity Diagram, Sequence Diagram, Class Analysis, Class Diagram analysis level).
- Development Strategic: Internet Impact (Software as a Services (SaaS), Web Based System Development, Cloud Computing), Outsourcing, In House Software Development option, Role analyst systems, Analysis of cost and benefit, Process of software acquisition, Transition system to design, design system guide, Prototyping, Software development trend.
- Design Phase: Translation from Analysis to Design, Architectural Design (Element - element, Client Server, User Interface and report Design, Code Design and data storage design).

PREREQUISITES

Data Structure

REFERENCE

- Dennis Wixom Roth, System Analysis & Design, 5 th, Wiley, 2009
- Shelly Rosenblatt, Systems Analysis and Design, 8 th, Course Technology, 2010
- Ian. Sommerville, Software Engineering, 9th ed., Addison-Wesley, 2011.
- M. Page-Jones, Fundamentals of Object-Oriented Design in UML, 1st ed., Addison-Wesley, 1999

COURSE	Course Name : Computer Network
	Course Code : IF184505
	Credit : 4 SKS
	Semester : 5

DESCRIPTION of COURSE

Students learn about the communication between computers and how the data is sent from one computer to another based on OSI Layer concept.

LEARNING OUTCOMES

Knowledge:

Mastering concept and theory of architecture, system and network computer principles based on logic;

Specific Skill:

Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient

COURSE LEARNING OUTCOMES

Students understand the concept of data transmission in a computer network and understand the concept of OSI layer. In addition, students are able to design the computer network.

MAIN SUBJECT

- **INTRODUCTION TO COMPUTER NETWORK:** computer network usage, hardware for computer network, network software, comparison of OSI and TCP/IP model, internet history, and network standardization.
- **APPLICATION LAYER:** HTTP, Email, FTP, P2P, Server Applications
- **TRANSPORT LAYER:** Transport layer services, elements in transport layer protocol, simple transport layer protocol, UDP, TCP
- **NETWORK LAYER:** Internet Protocol version 4 (IPv4), subnetting, routing
- **DATALINK LAYER:** Ethernet, ARP, WiFi, Bluetooth
- **COMPUTER NETWORK MANAGEMENT:** Basic of network management.
- **DATA TRANSMISSION TECHNIQUES:** Unicast, Broadcast, Multicast.

PREREQUISITES

Operating System

REFERENCE

James F. Kurose and Keith W. Ross, Komputer Networking: A Top-Down Approach, 7th Edition, Addison Wesley, 2013.

COURSE	Course Name : Web Programming
	Course Code : IF184504
	Credit : 3 SKS
	Semester : 5

DESCRIPTION of COURSE

Students will learn the technologies for developing web applications. In will be demonstrated how these technologies are employed in web sites. In addition, this course will explains about the principles of website design.

LEARNING OUTCOMES

Knowledge:

- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering the concepts and principles of:
 - Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
 - Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.
- Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to create client-server application and able to implement web-service-based application.

MAIN SUBJECT

- Web technology development and history
- Basic HTML: tag, component and attribute

- Implementation of client-server application using XHTML, CSS, PHP and JavaScript
- Introduction to ASP and ASP.NET
- Introduction of web form and class
- Basic ADO.NET
- Introduction to web service

PREREQUISITES

Object Oriented Programming

REFERENCE

Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 4th Edition, Pearson Education, Inc. , Upper Saddle River, NJ., 2008.

COURSE	Course Name : Computer Graphics
	Course Code : IF184502
	Credit : 3 SKS
	Semester : 5

DESCRIPTION of COURSE

In this course, students are taught a variety of materials and practices in order to be able to create an interactive graphics application program for designing specific objects according to user needs in real world by using graphics library (eg, OpenGL and Direct3D).

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students are able to explain the basics of graphics systems and graphics pipeline in a graphics library.
- Students are able to demonstrate a simple graphics program, based on the example.
- Students are able to create graphics programs that take advantage of the World Windows and Viewport.
- Students are able to create a simple interactive graphics application program.
- Students are able to explain the vector tools.
- Students are able to explain the concept of geometry, representation, and object transformations.
- Students are able to create a graphics program that involves the concept of object transformations.
- Students are able to explain the concept of object modeling using Polygonal Meshes.
- Students are able to explain the concept of a hierarchy of objects in 2D and 3D modeling.

- Students are able to apply the concept of 3D viewing into a graphics program.
- Students are able to apply the concept of rendering into a graphics program.
- Students are able to explain the concept of raster display.
- Students are able to apply the concept of depiction curves and surfaces into a graphics program.

MAIN SUBJECT

Fundamentals of graphics systems and graphics programming using graphics library (OpenGL and Direct3D), World window dan viewport, Vector tool, Transformation, Polygonal Mesh, Hierarchy Modelling, Viewing, Rendering, Raster display, Curve and surface.

PREREQUISITES

Object Oriented Programming.

REFERENCE

- FS Hill Jr, "Computer Graphics using OpenGL".
- Edward Angel, "Interactive Computer Graphics: A Top-Down Approach Using OpenGL", Sixth Edition, Pearson International Inc, 2012.
- Edward Angel, "OpenGLTM: A Primer", Third Edition, Addison-Wesley, 2002.
- Frank Luna, "Introduction to 3D Game Programming with DirectX 11", Mercury Learning & Information, 2012.
- Jason Zink, "Practical Rendering and Computation with Direct3D", A K Peters, 2011.
- Donald Hearn and M. Pauline Baker, "Computer Graphics with OpenGL", 3rd Edition.
- Alan Watt, "3D Computer Graphics", Addison-Wesley.

COURSE	Course Name : Computational Intelligence
	Course Code : IF184503
	Credit : 3 SKS
	Semester : 5

DESCRIPTION of COURSE

In this course students learn about the methods of classification, clustering methods, optimization methods, fuzzy logic, and a combination of these methods. Through theoretical discussion in the classroom as well as the application of case studies in the form of project assignments, students will have the experience to make an intelligent system with supervised learning based classification methods (Decision Tree, SVM, Neural Networks), to built intelligent systems based on unsupervised learning methods such as clustering methods (K-Means, Hierarchical Clustering, SOM), to create intelligent systems using fuzzy logic, to make intelligent systems based on optimization methods (GA, PSO, ACO), and to create intelligent systems that combine these methods. The task of the projects can be done individually or in groups.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to explain classifiers with linear and non-linear discriminant functions, Perceptron, Support Vector Machine (SVM).
- Students are able to explain the Fuzzy Logic and its use in rule-based systems, examples of the system controllers.
- Students are able to explain the Decision Tree and the establishment of an optimal structure as well as the occurrence of overfitting.
- Students are able to implement the methods that have been discussed such as SVM, Fuzzy Logic, and Decision Tree, in an application.
- Students are able to explain the various methods of clustering and its use.
- Students are able to explain the method of artificial neural networks with backpropagation algorithm, the non-linearly separable problems, neuro-fuzzy, and SOM.

- Students are able to implement the methods of clustering and neural networks in an application.
- Students are able to explain the methods of optimization with evolutionary algorithms: Genetic Algorithm (GA), Ant Colony (ACO), and Particle Swarm Optimization (PSO).

MAIN SUBJECT

- **KLASIFIER LINIER:** Fungsi diskriminan linier, multi kategori, algoritma Perceptron, Support Vector Machine (SVM), fungsi diskriminan non-linier.
- **FUZZY LOGIC (MULTI-VALUED LOGIC):** definisi, linguistic variables, crisp vs fuzzy set, membership function, fuzzification, inference mechanism, defuzzification, rules, fungsi Mamdani.
- **DECISION TREE:** contoh pengamatan, multivariate tree, entropy, information gain, overfitting
- **CLUSTERING:** persyaratan clustering, outliers, tipe data, similaritas, disimilaritas, variabel dengan tipe berbeda, K-Means Clustering, Fuzzy C-Means Clustering, Hierarchical Clustering: Agglomerative dan Divisive Clustering, Nearest Neighbor, K-Nearest Neighbor,
- **JARINGAN SARAF TIRUAN:** neuron, perceptron, supervised learning, multilayer neural network, algoritma Backpropagation, non-linearly separable problems, SOM: Kohonen.
- **EVOLUTIONARY ALGORITHM:** Genetic Algorithm (GA): definisi kromosom, mutation, crossover, fitness, selection, Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO)..

PREREQUISITES

Artificial Intelligence

REFERENCE

- Sergios Theodoridis, Konstantinos Koutroumbas, Pattern Recognition, 4th ed., Elsevier Inc., 2009.
- R.O. Duda, P.E.Hart, D.G.Stork, Pattern Classification, John Wiley & Sons, Inc., 2001
- Amit Konar, Computational Intelligence, Springer, 2005.
- C. H. Bishop, Pattern Recognition and Machine Learning, Springer Science, 2006
- Simon Haykin, Neural Networks: A Comprehensive Foundation (2nd Edition), Prentice Hall, 1998.

COURSE	Course Name : Software Design
	Course Code : IF184501
	Credit : 3 SKS
	Semester : 5

DESCRIPTION of COURSE

Through this course, students will be able to understand software design principles, decompose complexity of the problem domain, able to select suitable software design approach for a given problem domain, able to select an architecture which is suitable with software to be constructed, able to utilize design patterns on design problems. At the end, students have the ability to create software design model which is able to anticipate changes on the given case study using certain approach.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of:

- Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
- Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to apply the software design principle, software design approach, design pattern, framework reuse and interface design. Students also have awareness of key issues in software design.

MAIN SUBJECT

Software design principles: abstraction; coupling and cohesion; decomposition and modularization; encapsulation; separating of interface and implementation; sufficiency, completeness, and primitiveness; and separation of concerns. **Key issues in software design:** concurrency; event handling; data persistence; error handling; fault tolerance; security; etc. **Types of Software.** **Software design approach:** top-down; bottom-up; function-oriented; data structure-centered; object-oriented; and component-based. **Software**

Architecture Concepts: client-server; three-tier; Model-View-Controller; etc.
Design patterns: several patterns which is suitable with problem domain such as creational patterns; structural patterns; and behavioral patterns. **Framework reuse. Interface Design.**

PREREQUISITES

Object Oriented Programming, Web Programming (taking)

REFERENCE

- D. Budgen, Software Design, 2nd ed., Addison-Wesley, 2003.
- Robert C. Martin and Micah Martin, Agile Principles, Patterns, and Practices in C#, Prentice Hall, 2006.
- I. Sommerville, Software Engineering, 9th ed., Addison-Wesley, 2011.
- E. Gamma et al., Design Patterns: Elements of Reusable Object-Oriented Software, 1st ed., Addison-Wesley Professional, 1994.
- P. Bourque and R.E. Fairley, eds., Guide to the Software Engineering Body of Knowledge, Version 3.0, IEEE Computer Society, 2014.

COURSE	Course Name : Software Project Management
	Course Code : IF184506
	Credit : 3 SKS
	Semester : 5

DESCRIPTION of COURSE

This course explains about planning of an iterative software development (activities, schedule, resource assignment, implementation methods), planning a budget and control costs and how to assess the qualifications of team members and provide appropriate assignment

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of:

- Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
- Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to apply the management concept, project management, Software project management framework, project planning and evaluation.

MAIN SUBJECT

- Management Concept: Introduction to project management ,Classical Management Model
- Roles in Project Management
- The structure of organizational management / enterprise
- Software project management framework
- Case tool for software project management
- Project Planning
- Planning and evaluation
- Work breakdown structure (WBS)

- Task scheduling: Effort estimation, cost estimation, cost estimation techniques (Cocomo, activity base costing, etc.), Resources allocation
- Risk management: Project proposal
- Tender and legal aspects of the project: Tender, Preparing the legal aspects in the tender, Contract documents
- Organization and Project Personnel
- Organizational structure, position, responsibilities and authority
- Formal and informal communication
- Project staffing
- Personnel training, career development, and evaluation
- Meeting management
- Build and motivate teams: Conflict resolution, Project Control, Change control, Reporting and monitoring, Analyse and measure project results, Recovery and correction, Reward and discipline, performance standards

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

- Schwalbe, Kathy, "Information Technology Project Management" 5th Edition, 2007
- Bob Hughes and Mike Cotterell: Software Project Management, 4th Edition, McGraw-Hill 2005
- Elaine Marmel: Microsoft Office Project 2003 Bible, Wiley Publishing Inc.
- Basics of Software Project Management, NIIT, Prentice-Hall India, 2004
- Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002
- Software Project Management, A Concise Study, S.A. Kelkar, Revised Edition, Prentice-Hall India, 2003

COURSE	Course Name : Framework-based Programming
	Course Code : IF184605
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course students learn basic concept on framework design and utilize frameworks that are available on the markets. Students can use frameworks on software projects effectively and efficiently. The use of frameworks will be adjusted according to the context of the software projects. Students can identify framework needs, constraints, advantages, and disadvantages from the time and cost perspectives. Students can also design and implement software by taking framework into account. Moreover, students can modify and add new functionalities on the existing frameworks in order to suit our need.

LEARNING OUTCOMES

Knowledge:

Mastering principles of algorithm development and various programming language concepts

Specific Skill:

Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand the concept of framework-based programming. Students are able to identify the user requirement and develop framework-based system according to the requirements

MAIN SUBJECT

- Basic concept of framework; framework design methodology; principle of abstraction; differences between library and framework.
- DRY (don't repeat yourself) principle; simple case study on software development without framework (from scratch); simple case study on software development using framework.
- Frameworks on web platforms; frameworks on mobile platforms; frameworks on game platforms; frameworks on desktop platforms.
- Framework trade-offs on speed, line of code, learning curve, reduced flexibility, performance of software.
- Establish a software project and identify suitable frameworks based on requirement definition and software design.

- Reviewing framework documentation; analyzing constraints on selected frameworks.
- Minimizing overlap among frameworks on a software; optimizing the use of several frameworks altogether; code writing convention; several software architecture adapted in framework design.
- Analyzing extension points in a framework; adding new functionality that is not provided by the existing framework on a context of software being done.

PREREQUISITES

Object Oriented Programming

REFERENCE

- Cwalina, K., Abrams, B., “Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries 2nd Edition”, Addison-Wesley, Boston, 2008.
- McConnell, S., “Code Complete: A Practical Handbook of Software Construction, 2nd Edition”, Microsoft Press, Redmond, 2004.

COURSE	Course Name : Graph Theory and Automata
	Course Code : IF184604
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course, students will learn the graph concept, data structure that represent the graph, modeling and optimization to resolve some cases of graphs. Several cases of optimization that can be solved with graph theory including determining the shortest path, minimum spanning tree, determination of the minimum route, scheduling, assignment problem, matching and optimization flow in network;

The course of automaton will give the comprehensive knowledge of the background of developing some programming languages, give some lesson to construct a model which use an automaton as a tool.

In along semester, the students will get comprehensive exercise to defining some objects or sets of objects which using recursive definitions, in personal or/and in team's exercises.

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts;

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

- Students are able to implement the graph structure into array or linked-list and implement graph-based algorithm.
- The students are having capability to applying some rules of defining languages, including some appropriate mathematical operations
- The students are having capability to understanding some language 's modelling using finite automaton and some similar machines

- The students are having understanding the difference between determinism and non-determinism, and being able to operate some appropriate machines
- The students are having understanding the roles, techniques, and mechanism of grammar in programming languages
- The students are having capability to applying computability theory
- The students are having capability to applying complexity theory

MAIN SUBJECT

- Concepts of Graph: Graph & Simple Graph, Subgraph, Vertex Degree, Path & Connection, Cycles, Isomorphism, Tree, Directed Graph, Cut Edge & Cut Vertex, Spanning Tree, Types of Digraph & Their Connections, Fundamental Cycle, Some Special Graphs.
- Graphical representation of the structure of arrays, list, dan Standard Template Library (STL) pada bahasa pemrograman C/C++.
- Optimization of the graph: Shortest path, Minimum Spanning tree, The Chinese Postman Problem, The Travelling Salesman Problem, dan Vehicle Routing Problem.
- Planar graph: region, maximal planar graph, crossing number, bipartite graph, pewarnaan graf, dan bilangan kromatik.
- Theory and application matching pada graf.
- Theory and application Network pada graf.
- Language and some appropriate mathematical's operations Terminologi bahasa
 - Language terminology
 - Some operations on language
 - The Methods for defining language
 - Regular Expression
 - Halting Problem (Pumping Lemma)
- Finite Automata
 - Deterministic Finite Automata (DFA)
 - Transition Graph
 - Automata with Output
 - Teorema Kleene
- Non Determinism
 - Non Determinism
 - Non Deterministic Finite Automata (NFA)
 - DFA to NFA Converting
 - Pushdown Automata (PDA)
- Grammar
 - Grammar

- Derivation dan Parse Tree
- Grammar Classification
- Context-Free Language(CFL)
- CFL Transformation
- Computability Theory
 - Turing Machine
 - Non Deterministic Turing Machine
 - Mesin Church-Turing Thesis
 - Decidability
 - Reducibility
- Computability Theory
 - Time Complexity for NP-Complete
 - Space Complexity for NP-Complete

PREREQUISITES

Discrete Mathematics

REFERENCE

- Diestel, R., Graph Theory, 2000, Springer-Verlag
- Vasudev C, Graph Theory with Application, 2006, New Age International Publisher
- McHugh, J.A., Algorithmic Graph Theory, 1990, Prentice-Hall Inc.
- Liotta, G., Tamassia, R., Tollis, I., Graph Algorithms and Applications 2, 2004, World Scientific Pub.
- Introduction to the Theory of Computation , 3rd Edition, Cengage Learning, 2013
- Automata, Computability, and Complexity: Theory and Applications, Pearson International Edition, 2009

COURSE	Course Name : Human Computer Interaction
	Course Code : IF184601
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

Human Computer Interaction (HCI) course focuses on interaction between human and computer design process, and the interface development. Interaction between human and computer takes place in the interface and involves software and hardware. Interface design affects software lifecycle. Design and implementation of core functions in the software affect user interface. Because it deals with people as well as computers, as a knowledge area HCI draws on a variety of disciplinary traditions including psychology, computer science, product design, anthropology and engineering.

Through this course, students are expected to be able to apply human computer interaction principles on the software development as well as to do usability test on software and to report the result

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students understand the importance of human-centered software development.
- Students understand the basic rule/guidance of software development and interaction design by considering the physic, psychological, and social aspect.
- Students should be able to develop and use a conceptual vocabulary for analyzing human interaction with software: affordance, conceptual model, feedback, and so forth.
- Students should be able to define a user-centered design process that explicitly recognizes that the user is not like the developer or her acquaintances.
- Students should be able to develop applications followed by the guidance and documentation.

- Students should be able to create and conduct a simple usability test, to evaluate quantitatively (utility, efficiency, user simplicity, and user satisfaction) for an existing software application
- Students should be able to report and discuss the growth of the Natural User Interface technology: Multi-touch interface, Gestureinterface, Electroencephalography interface, Electromyography interface.

MAIN SUBJECT

- Basic principles of human, computer, and interaction paradigm.
- Basic principles of design process, modeling, and theory of human computer interaction (HCI).
- Processes for user-centered development: early focus on users, empirical testing, iterative design
- Different measures for evaluation: utility, efficiency, learnability, user satisfaction.
- Physical capabilities that inform interaction design: color perception, ergonomics.
- Cognitive models that inform interaction design: attention, perception and recognition, movement, and memory. Gulfs of expectation and execution.
- Social models that inform interaction design: culture, communication, networks and organizations.
- Principles of good design and good designers; engineering tradeoffs.
- Accessibility: interfaces for differently-abled populations (e.g. blind, motion-impaired), interfaces for differently-aged population groups (e.g. children, 80+)
- User interface standards
- Help & documentation
- Paper prototyping
- GUI design principles
- Assesment of current Natural User Interface technology.

PREREQUISITES

Object Oriented Programming

REFERENCE

- Alan Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale. Human-Computer Interaction (3rd Edition). Prentice-Hall, Inc., Upper Saddle River, NJ, USA. 2003.
- Johnson, Jeff. Designing with the mind in mind: Simple guide to understanding user interface design rules. Morgan Kaufmann, 2010.
- Wigdor, Daniel, and Dennis Wixon. Brave NUI world: designing natural user interfaces for touch and gesture. Elsevier, 2011.

- Donald A. Norman. The Design of Everyday Things: Revised and Expanded Edition. Basic Books, 2013.

COURSE	Course Name : Network Programming
	Course Code : IF184602
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

Students learn how to create applications that are able to communicate with other applications in a computer network using socket programming.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficiency
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand and are able to apply socket programming techniques, application layer protocol, I/O mechanism and data transmission techniques.

MAIN SUBJECT

- SOCKET PROGRAMMING TECHNIQUES: TCP socket, UDP socket, string manipulation, socket option, TLS/SSL.
- APPLICATION LAYER PROTOCOL: HTTP, SMTP, IMAP, POP, FTP
- INPUT/OUTPUT MECHANISMS: I/O Model, Blocking I/O, Non-Blocking I/O, Signal Driven I/O, I/O Multiplexing, Asynchronous I/O.

- DATA TRANSMISSION TECHNIQUES: Unicast, Broadcast, Multicast

PREREQUISITES

Computer Network

REFERENCE

- W. Richard Stevens, Bill Fenner, Andrew M. Rudoff,”Unix Network Programming Vol.1 3rd Edition”, Addison Wesley, 2003.
- Nathan Yocom, John Turner, Keir Davis,” The Definitive Guide to Linux Network Programming” ,Appress, 2004.Pustaka
- Elliotte Rusty Harold,” Java Network Programming 3rd Edition”, O'Reilly Media, 2004.
- Brandon Rhodes, John Goerzen, “Foundations of Python Network Programming”, Appress, 2013.

COURSE	Course Name : Requirement Engineering
	Course Code : IF184603
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

The students will learn about current advancement of methods, approaches, tools, and technologies in the fields of Requirements Engineering. Topics are chosen from a range of fields, such as requirements elicitation and discovery, requirements analysis, requirements specification, and requirements validation and verification

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of:

- Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
- Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to apply the technologies on requirements elicitation and discovery, scenario, requirements analysis, UML, requirements specification, SMART requirements, requirements validation and verification.

MAIN SUBJECT

Depending on the chosen topics, subjects in this unit may consist of knowledge and technologies on requirements elicitation and discovery, scenario, requirements analysis, UML, requirements specification, SMART requirements, requirements validation and verification.

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

Daniel Siahaan, "Rekayasa Kebutuhan, "Penerbit Andi, 2012.

COURSE	Course Name : Information and Network Security
	Course Code : IF184701
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Students learn techniques of information security that are stored inside computers and how to create a secure program.

LEARNING OUTCOMES

Knowledge:

Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand and able to apply basic concept of security, basic of encryption, encryption algorithm, data integrity and secure coding.

MAIN SUBJECT

- **BASIC CONCEPT OF SECURITY:** security property (confidentiality, integrity, availability, dll)
- **BASIC OF ENCRYPTION:** Number theory.
- **ENCRYPTION ALGORITHM:** Classic encryption, block, stream, symmetric, asymmetric.
- **DATA INTEGRITY:** Hash function, Message Authentication Code, Digital Signature, Digital Certificate, Public Key Infrastructure
- **SECURE CODING:** String vulnerability, buffer overflow, SQL injection, dynamic memory management, etc.

PREREQUISITES

Computer Network

REFERENCE

- Cryptography and Network Security: Principles and Practice (6th Edition) by William Stallings (Mar 16, 2013).
- Secure Coding in C and C++ (2nd Edition) (SEI Series in Software Engineering) by Robert C. Seacord (Apr 12, 2013).

COURSE	Course Name : Development of Analysis Algorithms
	Course Code : IF184902
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course students will learn about optimal abstraction from real problems with medium and hard complexity level. Student are also able to implements the abstraction into design of algorithms with regards to correctness and efficiency using formal representation. In the end, students also able to present whole steps in design and analysis of algorithms systematically, both in written and verbal.

LEARNING OUTCOMES

Knowledge:

Mastering principles of algorithm development and various programming language concepts ;

Specific Skill:

Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropiate applications

COURSE LEARNING OUTCOMES

Students are able to analyse and design algorithm correctly and efficiently

MAIN SUBJECT

- Algorithm and complexity
- Design and analysis of algorithm with divide and conquer paradigm: Binary search algorithm, Non-classical dynamic programming , Greedy algorithm
- Representation of several advance data structures that related to dynamic programming: Tree segment structure (range min/max query, range sum query) and lazy propagation, Fenwick Tree (binary indexed tree), Splay tree
- Design and analysis of algorithms in graph structures: Minimum spanning tree, All pair shortest path and single source shortest path, Strongly connected component, topological sort and 2-SAT problem, Maximum flow, minimum cut, and bipartite matching

- Design and analysis of algorithms in string matching problem: KMP, Boyer Moore, Trie data structure, Suffix array, suffix tree and suffix trie

PREREQUISITES

Design and Analysis Algorithms

REFERENCE

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms Third Edition", MIT Press, 2009
- Levitin, Anany, "Introduction to The Design & Analysis of algorithms 3rd ed", Addison-Wesley, 2012
- Robert Sedgewick, Kevin Wayne, Algorithms, 4th Edition, Addison Wesley, 2011
- Stephen Halim, Felix Halim, Competitive Programming, 3rd Edition, NUS School of Computing, 2013

COURSE	Course Name : Research Operation
	Course Code : IF184923
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course, students learn how to modeling problems in the real world into the Linear Program modeling (LP). Students learn the LP material with 2 variables, studying the PL solution using graphs, LP solution using Excel Solver and TORA. Simplex method begins with the equation model PL then transition from graph to algebraic solution, for more complex problems using the M-method and two-phase method then continued with Sensitivity Analysis. Duality begins with the definition of the dual problem, then the relationship between the primal and the dual, followed by the economic interpretation of duality, additional simplex algorithm and post-optimal analysis. Transport model begins with the definition of the transport models, non-traditional transportation models, algorithms and models of transport assignments. Network model begins with the scope and definition of the network model, the minimum spanning tree algorithm, the shortest route problem, maximal flow models, CPM and PERT. Integer Linear Programming begins with illustrative examples of applications, integer programming algorithm and traveling salesmen. For each sub-topics will be implemented into the program.

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts;

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

- Students are able to solve problems Linear Modeling Program.

- Students are able to solve a linear program using the simplex method.
- Students are able to perform a sensitivity analysis in linear programming.
- Students are able to solve the problem of duality.
- Students are able to solve the problem of transportation.
- Students are able to resolve network problems.
- Students are able to solve the problem of integer programming.
- Students are able to implement the above sub-topics into the program

MAIN SUBJECT

Linear Program modeling (LP); LP model with 2 variables, PL solution using graphs, LP solution using Excel Solver and TORA. Simplex method and Analisa Sensitivitas; equation model PL, transition from graph to algebraic solution, M-method and two-phase method then continued with Sensitivity Analysis. Duality dan post-optimal analysis; definition of the dual problem, relationship between the primal and the dual, economic interpretation of duality, additional simplex algorithm and additional post-optimal analysis. Transport model and variants; definition of the transport models, non-traditional transportation models, algorithms and models of transport assignments. Network model; the scope and definition of the network model, the minimum spanning tree algorithm, the shortest route problem, maximal flow models, CPM and PERT. Integer Linear Programming; illustrative examples of applications, integer programming algorithm and traveling salesmen.

PREREQUISITES

Linear Algebra

REFERENCE

Operation Research ; Hamdy A. Taha, University of Arkansas, Prentice Hall; eight edition, 2007

COURSE	Course Name : Game Development Techniques
	Course Code : IF184931
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

This course aims to make students able to develop a computer game based on the basic theories of game development. At the beginning of this course students will learn about the history and development of game technology, some popular games, also game classifications based on genres, theme and others.

The next stage will learn about the game development process, how to design a game, the game documentation (GDD), then learn about theory of fun in game and edutainment. Until the end of course, students with team will be able to implement game development.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students able to classify games based on genre, theme and rate
- Students able to create a game design document (GDD)
- Students with team able to develop a game with or without middleware

MAIN SUBJECT

Game theory, game development process, game design document, interface design for game, game middleware, edutainment, theory of fun.

PREREQUISITES

Human Computer Interaction

REFERENCE

Arnest Adam, "Fundamentals of Game Design", New Riders Press, 2nd Edition 2010

COURSE	Course Name : Multimedia Network
	Course Code : IF184941
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, the students will understand the concepts and procedures of the delivery of multimedia data (text, images, sound, and video). The multimedia data should be delivered in optimal and secure way. The students should perform the task individually and in groups. Materials of the course include the basics of multimedia and their representation, multimedia data compression to make them small enough to be distributed over a network, and securing multimedia data transmission over the network.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.
- Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to apply the multimedia representation, multimedia network, mutimedia distribution and multimedia security.

MAIN SUBJECT

- Basic multimedia: text, image, audio, video.

- Multimedia representation and multimedia compression.
- Multimedia network
- Multimedia distribution
- Multimedia security

PREREQUISITES

Computer Network

REFERENCE

- Henning Titi Ciptaningtyas, "Bahan Ajar Jaringan Multimedia", <http://share.its.ac.id>, 2013, IF-ITS.
- Jeniq-Neng Hwang, "Multimedia Networking From Theory to Practice", Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, "Fundamentals of Multimedia", Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy, "QoS Measurement and Evaluation of Telecommunications Quality of Service", Wiley, 2001. ISBN 0470845910.

COURSE	Course Name : Digital Image Processing
	Course Code : IF184952
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course students learn about the concepts of visual perception, graylevel and color images and binary images, image enhancement and restoration, discrete Fourier and wavelet transform, Hough transform, zooming. Furthermore, students learn the process of segmentation, feature extraction methods as image descriptors, methods of morphology, template matching, encoding and decoding. Students implement techniques learned in the project tasks, both individually and in groups.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to explain visual perception and definition of digital image processing.
- Students are able to explain image enhancement to increase contrast and to perform filtering using various methods in the spatial domain.
- Students are able to explain transformation and image filtering in the frequency domain, wavelet, and Hough transform.
- Students are able to explain the basics of color, color image processing, and pseudo color.
- Students are able to explain the process of image restoration to repair the degraded image visually, geometrically image registration, and zooming process.
- Students are able to implement digital image processing for visualization and analysis of the results.

- Students are able to explain the methods of segmentation with a variety of techniques, which based on boundary/edge detection, threshold values, and regions.
- Students are able to explain the concept of representation and description as well as feature extraction methods as image descriptors, and template matching method.
- Students are able to explain morphological method, especially for binary images.
- Students are able to explain the process of encoding and decoding, and the concept of image compression.
- Students are able to implement image segmentation, feature description and analyze the results.

MAIN SUBJECT

- IMAGE ENHANCEMENT IN SPATIAL DOMAIN: curve transformation, histogram, histogram equalization, convolution, median filter.
- IMAGE TRANSFORMATION: Fourier transform, wavelet, Hough transform.
- IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Ideal LPF, Butterworth LPF, Gaussian LPF (GLPF), IHPF, BHPF, GHPF.
- COLOR IMAGES: basics of color, color image processing, and pseudo color.
- IMAGE RESTORATION, WARPING, ZOOMING: Inverse filter, Wiener filter, registration, warping, zooming.
- SEGMENTATION: line/edge detection, thresholding, region based segmentation.
- REPRESENTATION AND DESCRIPTION: chain codes, polygon approach, signature, boundary segmentation, skeletoning, thinning.
- DESKRIPTOR: boundary descriptor, Fourier descriptor, topological descriptor, moment, texture, correlation
- MORFOLOGICAL METHODS: binary image, connectivity, dilation, erotion, morphological reconstruction, template matching, boundary extraction, thinning.
- ENCODING/DECODING: run-length encoding, Huffman code, JPEG, DCT transform, quantization, zig-zag sequence.

PREREQUISITES

Computational Intelligence

REFERENCE

- Gonzales, R.C., and Woods, R. E., “Digital Image Processing”,Prentice Hall,2008

- Pratt, W.K., "Digital Image Processing", John Wiley & Sons, Inc., 2007
- Forsyth, David A., and Ponce, Jean, "Computer Vision: A Modern Approach", 2nd Ed., Pearson Education, Inc., 2012
- Petrou, Maria, and Petrou, Costas, "Image Processing: The Fundamentals", John Wiley & Sons Ltd, 2010
- Costaridou, Lena (Ed.), "Medical Image Analysis Methods", Taylor & Francis Group, 2005
- Russ, John C., "The Image Processing Handbook", fifth edition, CRC Press, 2007

COURSE	Course Name : Enterprise Systems
	Course Code : IF184961
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course students learn business processes and enterprise information systems. Students are expected to achieve competence in analysis, design and implement enterprise systems related to the business processes. Several systems are discussed, such as financial accounting, management accounting and cost accounting. Customer Relationship Management (CRM), Supplier Relationship Management (SRM), and Enterprise Resource Planning (ERP) are also discussed.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to implement the architectures of enterprise information, architectures of enterprise applications, business process management, business process modeling, business process composition. Service oriented architecture (SOA), web services and enterprise service bus (ESB)

MAIN SUBJECT

Architectures of enterprise information, architectures of enterprise applications, business process management, business process modeling, business process composition. Service oriented architecture (SOA), web services and enterprise service bus (ESB)

PREREQUISITES

Database System

REFERENCE

- Simha R. Magal, Integrated Business Processes with ERP Systems, John Wiley & Sons, Inc., 2012

- Riyanarto Sarno, ANALISIS DAN DESAIN BERORIENTASI SERVIS UNTUK APLIKASI MANAJEMEN PROYEK, Andi Publisher, 2012, ISBN 978-979-29-3072-6.
- Manfred Reichert, Barbara We, Enabling Flexibility in Process-Aware Information Systems, Challenges, Methods, Technologies. Springer-Verlag, Berlin Heidelberg, 2012.
- Riyanarto Sarno, STRATEGI SUKSES BISNIS DENGAN TI Berbasis Balanced Scorecard dan COBIT, ITS Press, 2009, ISBN 978-979-8897-42-9.
- Riyanarto Sarno, et al. (2013). Petri Net Model of ERP Business Process Variations for Small and Medium Enterprises, Journal of Theoretical and Applied Information Technology, 10th August 2013. Vol. 54 No.1, pp.31-38.
- Riyanarto Sarno, Yeni Anistyasari dan Rahimi Fitri, SEMANTIC SEARCH, Andi Publisher, 2012, ISBN 978-979-29-3110-5.

COURSE	Course Name : Software Architecture
	Course Code : IF184971
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course, students design structures for software system according to requirement specification or given case studies. Disciplines in this course are determining high-level structures and dividing them into components, their dependencies and connectivities based on the software system characteristics. In developing the software architectural design, students can utilize design patterns that are available. Students also need to document their architectural design and use it as a communication tool among developers and other stakeholders.

LEARNING OUTCOMES

Knowledge:

- Mastering the concepts and principles of:
 - Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
 - Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand the types of software architecture and able to implement principles of software architecture design, layering concept and component dependencies, design patterns and enterprise application architecture, networked application architecture.

MAIN SUBJECT

- Types of software.
- Types of software architecture (monolithic, client-server, two-tier, three-tier, modelview-controller, etc).
- Principles of software architecture design.
- Layering concept and component dependencies.
- Diagram notations on software architecture.
- Software architecture viewpoints (logical view, process view, development view, and physical view).
- Design patterns (creational patterns, structural patterns, dan behavioral patterns).
- Enterprise application architecture, networked application architecture (optional)
- The issue of research in distributed systems (load balancing, load estimation, load migration, and big data)

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

- Gamma, Erich. Design Patterns: Elements of Reusable Object-oriented Software. Reading, Mass.: Addison-Wesley, 1995.
- Fowler, Martin. Patterns of Enterprise Application Architecture. Boston: Addison-Wesley, 2003.

COURSE	Course Name : Software Quality Assurance
	Course Code : IF184972
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

The purpose of this course is to provide knowledge to the students about the basic concepts and techniques of recent testing software. It also gives other important aspects related to software quality including: aspects of documentation, security, fault tolerance, reliability assessment, and so on. In some discussion, a case study is also given to allow students to apply the theories, concepts, and techniques into the given case.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of:

- Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
- Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to implement the concept of software testing and quality assurance.

MAIN SUBJECT

- Basics of software testing: Terminology related to testing, Main issues, Relationship among testing and other activities
- Testing level: Testing targets, Testing objectives
- Testing techniques: Based on the software engineer's intuition and experience, Input domain-based techniques, Code-based techniques,

Fault-based techniques, Usagebased techniques, Model-based testing techniques, Techniques based on the nature of the application

- Test-related measures: Evaluation of the program under test, Evaluation of the tests performed
- Test Process: Practical considerations, Test activities
- Software testing tools: Testing tool support, Categories of tools
- Basics of software quality: Software ethics and culture, Value and cost of software quality, Software quality and model characteristics, Software process improvement, Aspects related to software safety

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

- S. Naik and P. Tripathy, Software Testing and Quality Assurance: Theory and Practice, Wiley-Spektrum, 2008.
- S.H. Kan, Metrics and Models in Software Quality Engineering, 2nd ed., Addison-Wesley, 2002.
- D. Galin, Software Quality Assurance: From Theory to Implementation, Pearson Education Limited, 2004.

COURSE	Course Name : Wireless Networking
	Course Code : IF184911
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Wireless Network is a part of the vast development of computer network technology. The use of wireless infrastructures provides mobility aspect in nearly everything. This course discuss many aspects of wireless network, particularly in infrastructure and technology.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students are able to implement concept of various wirelss network architectures with concern of performance improvement and problem solving.

MAIN SUBJECT

- Introduction of Wireless LAN and Cellular Network.
- Antenna and Spectrum
- Wireless LAN infrastructures
- Wireless LAN standards
- 802.11 architectures
- Medium Access Control and Physcal Layer
- Troubleshooting of wireless LAN
- Security of Wireless LAN

- Mobile Adhoc Network, Wireless Sensor Network
- Adhoc network and Routing
- Mobile IP concept
- Mobile Transport Layer

PREREQUISITES

Computer Network

REFERENCE

- Coleman, D., Westcott, D., “CWNA: Certified Wireless Network Administrator Official Study Guide”, Wiley Publishing Inc., 2009.
- Schiller, J.H., “Mobile Communications 2nd Edition”, Addison-Wesley, 2004.
- Stallings, W., “Wireless Communications and Networking 2nd Edition”, Prentice Hall, 2004.
- James F. Kurose and Keith W. Ross, Komputer Networking: A Top-Down Approach, 7th Edition, Addison Wesley, 2013.

COURSE	Course Name : Internetworking Technology
	Course Code : IF184912
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

The purpose of this course is to allow students to understand the use of TCP / IP in the computer networks. In addition, this course also discusses the routing algorithm and its implementation. This unit will examine some routing protocols and its supporting devices, such as routers, switches, as well as the concept of IP v4 and IP v6.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand the concept of internetworking technology. Students are able to apply the internetworking technology including static routing, dynamic routing, setting up LAN and VLAN.

MAIN SUBJECT

Introduction to Inter-Networking Technologies: Understanding the purpose of lecture in networks technology, learning organization, Components & Evaluation Form; Subnetting & Static Routing: IP, CIDR, VLSM, NAT, Static Routing, CISCO IOS; Switching Layer 2: Switching services, Spanning Tree protocol, LAN Switch; Kinds of Dynamic Routing: Distance Vector Routing, Link State Routing; Virtual LANs: VLAN, VLAN Trunking Protocol, VLAN

Routing, Configuration; Virtual Private Network: VPN, Configuration; Routing Information Protocol: RIPv1, RIPv2; Interior Gateway Routing Protocol: IGRP Timers, Configuration; Enhanced IGRP: Features, Neighbor Discovery, RTP, DUAL, AS; OSPF and IS-IS: Algorithms, Configuration; IP Traffic Engineering: Traffic, Network Flow Optimization, Shortest Path Routing and Network Flow, MCNF Duality; Border Gateway Protocol: Algorithms, Message Formats, Operations, Configuration; Internet Routing Architecture: Illustration, Architectural View of the Internet, Allocation of IP Prefixes and AS Number; Quality of Service Routing: QOS Attributes, Shortest Path and widest Path Routing, Source-based QOS Routing, QOSPF; IPv6: Terminology, Packet Format, Difference with IPv4, IPv4 to IPv6 Tunneling PREREQUISIT

PREREQUISITES

Computer Network

REFERENCE

- Todd Lammle, CCNA Study Guide, Third Edition, 2002
- Deepankan Medhi, Karthikeyan Ramasamy, Network Routing Algorithms, Protocols, and Architectures, 2007

COURSE	Course Name : Mobile Device Programming
	Course Code : IF184901
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course, students will learn how to build mobile device applications using Android platform. The students understand the concept and technical aspect of the development of mobile device application.

LEARNING OUTCOMES

Knowledge:

- Mastering the concepts and principles of:
 - Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
 - Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.
- Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

- Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities
- Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

Students understand and able to apply the methods in mobile device programming.

MAIN SUBJECT

Android basics: building hello world application, adding the Action Bar, supporting different devices, managing the activity lifecycle, building a dynamic UI with fragments, saving data. Content sharing: sharing simple data, sharing files. Multimedia: managing audio playback, capturing photos. Connectivity: performing network operations, syncing to the cloud.

PREREQUISITES
Object Oriented Programming
REFERENCE
• Beginning Smartphone Web Development , Gail Rahn Frederick with Rajesh Lal, Appress, 2009 • Hello, Android, Introducing Google's, Mobile Development Platform, 2nd Edition, Ed Burnette, The Pragmatic Bookshelf, Raleigh, North Carolina Dallas, Texas, 2009

COURSE	Course Name : Modeling and Simulation
	Course Code : IF184921
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, students learn concept & procedure in creating simulation model of a real system which the performance efficiency is under study, run a simulation model, draw conclusion on efficiency based on the analysis of simulation output, develop alternative system and compare performance based on the output of simulation run and the output of the real system, able to work individually and in a group.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts;

Specific Skill:

- Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students can apply concept & procedure in creating simulation model of a real system which performance efficiency is under study, run a simulation model,

draw conclusion on efficiency based on the analysis of simulation output, develop alternative system and compare performance based on the output of simulation run and the output of the real system, able to work individually and in a group.

MAIN SUBJECT

- Modeling and Simulation concepts
- Modeling and Simulation relationship
- Probability distribution and visualization in modeling and simulation
- Input modeling
- Output analysis
- Creating simulation model using simulation tool

PREREQUISITES

Probability and Statistics

REFERENCE

- Banks, J., John S. Carson II, "Discrete-Event System Simulation", Prentice Hall, 2009.
- Law, A., "Simulation Modeling and Analysis", McGraw-Hill, 2006.

COURSE	Course Name : Virtual and Augmented Reality
	Course Code : IF184932
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

This course discusses aspects related to the development of virtual reality and augmented reality application, input and output elements that is used in the virtual reality, optical modeling to produce stereoscopic view, and virtual reality programming.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students are able to fully understand the theory of Virtual Reality (VR) and Augmented Reality(AR) : hardware and software.
- Students are able to design and develop basic virtual environment, able to implement a good manner of interaction, and able to do modeling.
- Students are able to develop 3 dimensional VR and AR.

MAIN SUBJECT

Komputasi dalam game, game simulasi, game multi pemain, game sosial, game economy

PREREQUISITES

Human Computer Interaction.

REFERENCE

- Grigore, C Burdea & Philippe, Coiffet, “Virtual Reality Technology”, Wilye Interscience, 2003.
- William R. Sherman, Alan B.Craig, “Understanding Virtual Reality”, Morgan-Kaufmann, Inc., 2003.

COURSE	Course Name : Game System
	Course Code : IF184933
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, students will learn about various aspect required to develop complex game. The students will study about serious game, simulation game, game computation, network for game, multiplayer game, social game and game economy.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students can explain various aspects to develop a complex game.
- Students can explain computation in games, multiplayer games, social games, simulation games and game economy.
- Students able to develop a game with one or more aspects of computation, network, simulation or social.

MAIN SUBJECT

Game computation, simulation game, multiplayer game, social game, game economy.

PREREQUISITES

Human Computer Interaction.

REFERENCE

- Social Game Design, Monetization Methods and Mechanics, Tim Fields 2012
- Theory of Fun for Game Design, Ralph Koster, 2nd Edition Nov 2013
- David Michael, "Serious Games, Games that Educate, Train and Inform", Thomson Course Tech, Canada, 2005

COURSE	Course Name : Cloud Computing
	Course Code : IF184942
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Cloud computing is a new paradigm in the information technology services industry. Cloud computing technology orientates to the user in terms of services, the provision of computing resources in a transparent manner. This course will discuss the basic and the introduction of cloud technologies, mechanisms, and architecture along with the latest technology and research in cloud computing (OGSA).

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand the concept and model of cloud computing and able to implement the cloud computing architecture and cloud computing security.

MAIN SUBJECT

- Concept and Model: Technology, Security
- Cloud Characteristic : Limitation, On demand Usage, Ubiquitous Access, Multitenancy, Elasticity, Measured Usage
- Delivery Model : IaaS, PaaS, SaaS
- Deployment : Public, Community, Private, Hybrid
- Technology : Internet, Data Center, virtualisasi, Web, Service, Multitenancy, Cloud infrastructure software
- Cloud Computing Security -- Threat, Cloud Security Threats

- Cloud Computing Security Mechanism-- Public Key Infrastructure, Hashing, Digital Signature, SSO, Virtual Server
- Architecture - Workload Distribution, Resource Pooling, Dynamic Scalability
- Architecture - Elastic Resource Capacity, Service Load Balancing, Cloud Bursting.

PREREQUISITES

Computer Network

REFERENCE

- Thomas Erl et al, "Cloud Computing, Concepts, Technology. And Architecture". Prentice Hall.
- Hill et al, "Guide to Cloud Computing, Principles and Practice". Springer.Jeniq-Neng Hwang, "Multimedia Networking From Theory to Practice", Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, "Fundamentals of Multimedia", Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy,"QoS Measurement and Evaluation of Telecommunications Quality of Service", Wiley, 2001. ISBN 0470845910.

COURSE	Course Name : Mobile Computing
	Course Code : IF184943
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Students learn the concept of mobile computing and various applications working in the mobile environment, mobile ad hoc and delay tolerant networks.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand the concept and domain problem of mobile computing. Students are able to develop mobile system.

MAIN SUBJECT

- Wireless network and its limitation
- Characteristics and system dimension which works in a mobile environment
- Mobility modelling and characterizing in a mobile environment
- Location management by a system in a mobile environment

- Ad hoc and delay tolerant networks along with their strengths and weaknesses
- Mobile information access problems and application adaptation relates to energy, resource availability etc
- Spontaneous networking, mobile peer-to-peer and its application 8. Routing in ad hoc and delay tolerant networks
- Mobile computing related-issues

PREREQUISITES

Computer Network

REFERENCE

- Abdessalam Helal, Et.Al,” Anytime, Anywhere Computing, Mobile Computing Concepts and Technology” , McGraw-Hill,
- Mobile Computing Principles Designing And Developing Mobile Applications With Uml And Xml and the Environment”, Oxford Publisher 2002.
- Location Management and Routing in Mobile Wireless Networks,Amitava Mukherjee, Somprakash Bandyopadhyay, Debashis Saha, Artech House Publisher
- Andreas Heinemann, Max Muhlhauser", Peer-to-Peer Systems and Application
- Mohammad Ilyas and Imad Mahgoub, Mobile Computing Handbook, Auerbach PublicationHill et al, “Guide to Cloud Computing, Principles and Practice”. Springer.Jeniq-Neng Hwang, “Multimedia Networking From Theory to Practice”, Cambridge, 2013. ISBN 9780521882040.
- Ze-Nian Li and Mark. S. Drew, “Fundamentals of Multimedia”, Prentice-Hall, 2003. ISBN 0130618721.
- W.C. Hardy,”QoS Measurement and Evaluation of Telecommunications Quality of Service”, Wiley, 2001. ISBN 0470845910.

COURSE	Course Name : Distributed System
	Course Code : IF184944
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

This course discuss about how to coordinate processes on many computer connected via fast local network or slow network to achieve a single purpose.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand and able to coordinate processes on many computer connected via fast local network or slow network to achieve a single purpose.

MAIN SUBJECT

- Introduction to distributed systems: concepts, goals, and limitations
- Interprocess communication: message passing, remote procedure calls, distributed objects and naming
- Distributed systems-based programming: UDP/TCP socket and the use of middleware
- Indirect communication (publish subscribe and tuple space)
- Middleware for distributed systems (middleware for publish subscribe, map reduce, peer to peer, and message queue)
- Concepts, standards, and middleware on multi-agent and mobile agent
- Distributed file systems and examples of its application

- | |
|---|
| <ul style="list-style-type: none">• Research topic in mobile computing, pervasive computing, ubiquitous computing, and cloud computing• The issue of research in distributed systems (load balancing, load estimation, load migration, and big data) |
| PREREQUISITES |
| Computer Network |
| REFERENCE |
| <ul style="list-style-type: none">• Coulouris, G., Dollimore, J., Kindberg, T., Blair, G., “Distributed Systems: Concepts and Design 5th Edition”, Addison-Wesley, 2011 |

COURSE	Course Name : Digital Forensic
	Course Code : IF184945
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

Digital Forensics explains various forensic methods in file, operating system, web, computer networks, and on mobile devices as well as anti-forensic technique.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

- Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand and are able to implement various forensic methods in file, operating system, web, computer networks, and on mobile devices as well as anti-forensic technique.

MAIN SUBJECT

- The basic principles and methodologies of digital forensics
- Introduction, search, and seizure of digital evidence
- Techniques of data preservation
- Forensic on operating system
- Forensics on file

- Forensics on the web
- Forensic computer network
- Forensics on mobile devices
- Investigation of attacks on computer networks network
- Anti-forensic techniques

PREREQUISITES

Computer Network

REFERENCE

- Nelson, B., “Guide to Computer Forensics and Investigations”, Cengage Learning, 2009
- Casey, E., “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet”, Academic Press, 2011
- Casey, E., “Handbook of Digital Forensics and Investigation”, Academic Press, 2009
- Sammons, J., “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, Elsevier, 2012
- Altheide, C., Carvey, H., “Digital Forensic with Open Source Tools”, Elsevier, 2011
- Hoog, A., “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier, 2011
- Daniel, L., Daniel, L., “Digital Forensics for Legal Professionals Understanding Digital Evidence From The Warrant To The Courtroom”, Elsevier, 2011

COURSE	Course Name : Data Mining
	Course Code : IF184951
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

Students will learn about data mining and data analysis in big scale data using various data mining algorithms.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

- Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand data types, sources of data and concept of data preprocessing. Students are able to develop data mining system using machine learning methods

MAIN SUBJECT

- Introduction of Data Mining, data source, data type and attribute type.
- Proximity dan preprocessing
- Association rule process

- Classification process
- Clustering process
- Outlier detection

PREREQUISITES

Artificial Intelligence

REFERENCE

- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, Addison-Wesley, 2005.
- Han, Jiawei; Kamber, Micheline, ”DATA MINING : CONCEPT AND TECHNIQUES”, Morgan Kauffman Pub, 2001
- Rajaraman, Anand, “Mining of Massive Datasets”, Stanford University, 2011

COURSE	Course Name : Biomedical Computation
	Course Code : IF184953
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course, students will learn computation applied on biomedical areas. Students also will learn about various kinds of format and characteristics of biomedical data such as: clinical lab data, signal data (ECG, EEG), medical image data (X-Ray, MRI, USG, Patology) and gene data (DNA, Microarray, protein). Those data will be analysed and modeled using statistical methods and machine learning methods to solve biomedical problems.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to identify problems on biomedical field.
- Students are able to analyze biomedical problems based on existing biomedical data.
- Students are able to design and implement statistical methods and machine learning methods to model solutions in the biomedical field.

MAIN SUBJECT

Introduction to biomedic, biomedical data description (numeric data, signal data, image data, gene data), analysis and modeling of biomedical data using probabilistic, classification, clustering and regression method.

PREREQUISITES

Computational Intelligence

REFERENCE

Biomedical Informatics, Edward C Shortlife & James J. Cimino

COURSE	Course Name : Information Retrieval
	Course Code : IF184955
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Students will learn text data processing techniques to retrieve information on text-formed data. Discussion subjects includes preprocessing, feature extraction, calculation of text similarity level based on query input, and show the searching results. Then, relevance feedback technique, text classification and clustering to help user on search. Students will design, analyse and apply information retrieval methods on various real problems either individually or team work.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation

Specific Skill:

- Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently

COURSE LEARNING OUTCOMES

- Students are able to explain concepts, theory, terms in various kinds of information retrieval and its application.
- Students are able to implement problem solving techniques such as: indexing, searching, query processing in information retrieval requirement.

- Students are able to make a searching machine to extract information as a simple implementation prototype and categorize results as an ease of visualitation.

MAIN SUBJECT

- Retrieval model with Boolean, vector space, probabilistic, library lucene, performance evaluation, relevance feedback, web search, classification and clustering.
- Applications: image-based retrieval, latent semantic indexing, recommendation system, information extraction.

PREREQUISITES

Computational Intelligence

REFERENCE

- Ricardo Baeza-Yates, Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search 2nd Ed”, Addison-Wesley, New Jersey, 2011
- Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008

COURSE	Course Name : Computer Vision
	Course Code : IF184956
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Computer vision aims to automatically compute information and decide from an observed image, image set or an image sequence. It combines concepts from 'image processing' and 'computational intelligence'. Computer vision has many various potential applications, including medical applications, surveillance (e.g. face recognition), industrial inspection, satellite imaging, etc. This unit covers topics such as feature extraction, image segmentation and recognition. It also covers camera calibration and projective geometry and how three-dimensional information can be reconstructed from single images, stereo pairs of images and motion sequences.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to describe computer vision problems in writing.
- Students are able to write MATLAB code to solve computer vision problems.
- Students are able to explain the theories and principles in computer vision.
- Students are able to conduct independent research on a chosen research topic, write a small research report, and give an oral presentation.
- Students are able to demonstrate logical thinking and problem-solving skills.
- Students are able to critique various methodologies for solving problems in computer vision.

MAIN SUBJECT

- Introduction: image formation, camera models, perspective geometry, overview of current state-of-art computer vision systems.
- Review of Digital Image Processing Unit: Binary Image Analysis, Fourier Transform, Grayscale Image Analysis.
- Recognition and classification: Feature extraction, Edge detection.
- 3D Reconstruction: Camera calibration, Projective geometry, Stereo, epipolar geometry, and structured light systems.
- Optical flow and tracking.
- 3D shape analysis and matching.

PREREQUISITES

Computational Intelligence

REFERENCE

- Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer-Verlag, London, 2011.
- David A. Forsyth dan Jean Ponce, “Computer Vision: A Modern Approach, 2nd Edition”, Prentice Hall, 2012.
- Christian Wöhler, “3D Computer Vision: Efficient Methods and Applications”, Springer-Verlag, Berlin Heidelberg, 2009.
- Francisco Escolano, Pablo Suau, Boyán Bonev, “Information Theory in Computer Vision and Pattern Recognition”, Springer Verlag, London, 2009.

COURSE	Course Name : Knowledge Engineering
	Course Code : IF184962
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this subject, student will learn about the concept of tacit knowledge and knowledge engineering techniques related to elicit, model, distribute, and use the knowledge effectively. At the end of the course, students should be able to implement knowledge engineering into application either independently and cooperatively.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collecting, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to implement the concept of knowledge engineering including acquisition, validation, representation, inference, explanation and justification and semantic web.

MAIN SUBJECT

- Introduction to Knowledge Engineering: data, information and knowledge, knowledge elicitation techniques, knowledge modelling techniques.
- Knowledge Acquisition: knowledge acquisition definition, techniques and methods in knowledge acquisition
- Knowledge Validation: definition, parameters, and validation measurement processes, technique and method to validate knowledge
- Knowledge Representation: definition, knowledge engineering process, techniques in knowledge engineering
- Inference, Explanation and Justification
- Semantic Web: semantic web roadmap, ontology and knowledge representation on semantic web, semantic web education, layer cake, XML, RDF/S
- Knowledge engineering application to solve the actual problems

PREREQUISITES
Database System
REFERENCE
• Simon Kendal and Malcolm Creen, an Introduction to Knowledge Engineering, Springer, 2006. • R.J. Brachman and H.J. Levesque, Knowledge Representation and Reasoning, Elsevier, 2004. • Segaran, Evans, and Taylor, Programming the Semantic Web, O'Reilly, 2009.

COURSE	Course Name : Systems Audit
	Course Code : IF184963
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course students learn the concept of system audit including information technology audit, control procedures, risk management, disaster recovery plan for business continuity. The course discusses planning and implementing audit as well as the recommendation to increase the performance of the systems. The course also covers investigation, maturity evaluation and compliance evaluation in comparison with standard operating procedures and the governance.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to apply the concept of systems audit.

MAIN SUBJECT

Planning and implementing audit processes. Investigation methods, analysis and maturity evaluation. Compliance evaluation based on the standard operating procedures. Recommendation for increasing risk management and system

PREREQUISITES

Database System

REFERENCE

- Riyanarto Sarno, Audit Sistem Informasi/Teknologi Informasi, ITS Press, 2009.
- Riyanarto Sarno, Strategi Sukses Bisnis dengan Teknologi Informasi Berbasis Balanced Scorecard dan COBIT, ITS Press, 2009, ISBN 978-979-8897-42-9.
- Simha R. Magal, Integrated Business Processes with ERP Systems, John Wiley & Sons, Inc., 2012

- Riyanarto Sarno & Irsyat Iffano, Sistem Manajemen Keamanan Informasi, ITS Press, 2009

COURSE	Course Name : Big Data
	Course Code : IF184966
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course students will learn about current issues and aspects in big data. This course focuses on introduction and implementation of big data with large scale, large variety, and high speed access (volume, variety, and velocity). Students also learn about data processing techniques and data mining for big data.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand current issues and aspects in big data. Students are able to implement big data with large scale, large variety, and high speed access (volume, variety, and velocity).

MAIN SUBJECT

- Data Mining
- MapReduce
- Finding Similar Items (Near-Neighbor Search, Shingling of Documents).
- Mining Data Streams
- Link Analysis
- Frequent Itemsets
- Clustering
- Advertising on the Web
- Recommendation System
- Mining Social-Network Graphs
- Dimensionality Reduction

PREREQUISITES

Database System

REFERENCE

- J. Leskovec, A. Rajaraman and J. Ullman, "Mining of Massive Datasets," 15 August 2014. [Online]. Available: <http://www.mmds.org/>
- H. Cuesta, Practical Data Analysis, Birmingham: Packt Publishing Ltd., 2013.
- V. Mayer-Schönberger and K. Cukier, Big Data: A Revolution That Will Transform How We Live, Work, and Think, New York: Eamon Dolan/Houghton Mifflin Harcourt, 2013.
- N. Sawant and H. Shah, Big Data Application Architecture Q&A, A Problem - Solution Approach, New York: Apress, 2013.
- P. Giacomelli, Apache Mahout Cookbook, Mumbai: Packt Publishing, 2013.
- V. Prajapati, Big Data Analytics with R and Hadoop (Community Experience Distilled), Mumbai: Packt Publishing, 2013.

COURSE	Course Name : Software Evolution
	Course Code : IF184973
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

Students will learn about software as an entity that is constantly evolving and complex. In addition, they are also equipped with common issues related to software maintenance, the importance of software design related to its maintenance efforts, reverse engineering techniques to improve the software interability. In some discussion, a case study is also given to allow students to apply the theories, concepts, and techniques in the case.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of:

- Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
- Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.

Specific Skill:

Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities

COURSE LEARNING OUTCOMES

Students understand and able to apply the concept and methods of software evolution including program comprehension, code cloning, software repositories, fault prediction and refactoring.

MAIN SUBJECT

- ROAD MAP AND EMPIRICAL STUDY: history and challenge in software evolution; the similarity and difference between software evolution and software maintenance.
- LEHMAN'S LAW: Lehman's law in software evolution, introduction to S-, P-, and Esystem type.

- **THE ACTIVITIES IN SOFTWARE EVOLUTION:** the types of software maintenance such as corrective, adaptive, perfective, and preventive; activities in software interoperability; software changes analysis, tools in software evolution e.g. DDF, CFG, etc.
- **PROGRAM COMPREHENSION:** program structure visualization, static code analysis, control dependencies diagram, CFG.
- **CODE CLONING:** introduction to cloning; cloning types; cloning sources; cloning evolution, clone detection and management; clone removal techniques, clone algorithm and development.
- **SOFTWARE REPOSITORIES:** introduction to software repositories and software repository analysis; releas history.
- **FAULT PREDICTION:** predict fault from history and log in software development; the cause of defect-prone software, software metrics; the techniques to predict fault using code churn, related issues; the threats to validity.
- **REFACTORING:** refactoring techniques, bad smell code removal, the advantages, risks, and refactoring cost.
- **SOFTWARE EVOLUTION TOOLS:** tools to predict detect code clone and bad smell code, tools to software repository.
- **SOFTWARE METRICS:** the types of software metrics such as LOC, aggregration metric, structure and modular metric of object oriented program, package metric, churn metric, and time and cost estimation metric.

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

- Stephan Diehl, Software Visualization: Visualizing the Structure, Behaviour, and Evolution of Software, Springer-Verlag, Berlin, 2007.
- Nazim H. Madhavji, Juan Fernandez-Ramil, dan Dewayne Perry, Software Evolution and Feedback: Theory and Practice, John Wiley & Sons, England, 2006.
- J. Fernandez-Ramil et al., Empirical Studies of Open Source Evolution.
- R. Koschke, Identifying and Removing Software Clones.
- E. Duala-Ekoko and M.P. Robillard, Tracking Code Clones in Evolving Software, In Proceedings of the 29th International Conference on Software Engineering.

- Z. Li and Y. Zhou, PRMiner: Automatically Extracting Implicit Programming Rules and Detecting Violations in Large Software Code. Software Engineering Notes, 2005.
- S. Hangal and M.S. Lam, Tracking Down Software Bugs Using Automatic Anomaly Detection. In Proceedings of the 24th International Conference on Software Engineering, 2002.
- D'Ambros et al., Analyzing Software Repositories to Understand Software Evolution.

COURSE	Course Name : Software Construction
	Course Code : IF184974
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course students deliberately execute steps on the construction phase to produce high-quality software that is easy to maintain (high maintainability). Students perform detailed design, coding and testing in a selected case study. The construction emphasizes on code readability, code maintainability, bugs and error prevention. Students also collaborate with other students as developers and experience software integration.

LEARNING OUTCOMES

Knowledge:

- Mastering the concepts and principles of:
 - Design and development of software using standardized and scientific methods of planning, requirement engineering, design, implementation, testing, and product releasing, to produce software products that meet various parameters of quality, i.e. technical, managerial, and efficient;
 - Making simple programs in common programming languages as well as object-oriented programming languages, creating web applications and desktop applications, creating simple database to solve problems in the context of general software development.
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to analyze, design and build software using software engineering process principles to produce software that meets both technical and managerial qualities
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students understand and able to apply the approach of software construction.

MAIN SUBJECT

- Phases on software construction.

- Software development metaphors.
- Prerequisites of software construction.
- Software construction approach.
- Creating high-quality code: creating classes, creating procedures or routines.
- Version control system: workflow using Git (commit, push, pull, and branching).
- Defensive programming: error handling, assertions, exceptions, and debugging.
- Coding convention: use of variables and data types, variable naming, code layouting.
- Statement organization: branch structures, loop structures.
- Code improvements: unit testing, debugging, and refactoring.
- Integration: integration approaches, incremental strategy, daily builds, and smoke test.
- Case study on software construction.

PREREQUISITES

Analysis and Design of Information Systems

REFERENCE

- McConnell, S. Code Complete: A Practical Handbook of Software Construction, 2nd Edition. Redmond, Wash: Microsoft Press, 2004.
- Fowler, Martin, and Kent Beck. Refactoring: Improving the Design of Existing Code. Reading, MA: Addison-Wesley, 1999.
- Martin, Robert C., and Micah Martin. Agile Principles, Patterns, and Practices in C#. Upper Saddle River, NJ: Prentice Hall, 2007.
- Brooks, Frederick P. The Mythical Man-month Essays on Software Engineering. - Anniversary Ed. Reading, Mass.: Addison-Wesley Pub., 1995.
- Gamma, Erich. Design Patterns: Elements of Reusable Object-oriented Software. Reading, Mass.: Addison-Wesley, 1995.

COURSE	Course Name : IoT Technology
	Course Code : IF184914
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

Students learn the concept of IoT technology and various applications working in the IoT environment.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

- Able to design and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and efficient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.
- Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES
Students understand and able to apply the approach of IoT technology.
MAIN SUBJECT
Ubiquitous Computing: Basics and Vision, Modelling the Key Ubiquitous Computing, Ubiquitous System Environment Interaction, Architectural Design for UbiCom Systems: Smart DEI Model; Smart Devices and Services: Service Architecture Models, Service Provision Life Cycle, Virtual Machines and Operating Systems; Human–Computer Interaction : User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices; Tagging, Sensing and Controlling : Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real Time Systems, Control System and Robots; Context-Aware Systems : Modelling Context Aware Systems, Mobility Awareness, Spatial Awareness, Temporal Awareness: Coordinating and Scheduling, ICT System Awareness; Intelligent Systems (IS) : Basic Concepts, IS Architectures, Semantic Knowledge Based IS, Classical Logic IS, Soft Computing IS Models, IS System Operations; Ubiquitous Communication : Audio Networks, Data Networks, Wireless Data Networks; Management of Smart Devices : Managing Smart Devices in Virtual Environments, Managing Smart Devices in Human User Centred Environments, Managing Smart Devices in Physical Environments
PREREQUISITES
Computer Network
REFERENCE
• Stefan Poslad, Ubiquitous Computing Smart Devices, Environments, and Interaction, JohnWiley&Sons, Ltd., 2009 • Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill, 2005

COURSE	Course Name : Security Design Of System And Network
	Course Code : IF184913
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

Students learn advanced topics about software security, malicious software, malicious software analysis, and network security

LEARNING OUTCOMES

Knowledge:

Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

KeterampilanKhusus:

Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

COURSE LEARNING OUTCOMES

Students understand and able to apply advanced topics about software security, malicious software, malicious software analysis, and network security

MAIN SUBJECT

- SECURITY OF SOFTWARE: Email Security, User authentication Protocol (Kerberos, RADIUS, etc), and Web Application Firewall.
- MALICIOUS SOFTWARE ANALYSIS: Intrusion Detection System, Honeypot, Malware Analysis.
- NETWORK SECURITY: Routing Protocol, VPN, IPSec

PREREQUISITES

Information and Network Security

REFERENCE

- Intrusion Detection Networks: A Key to Collaborative Security by Carol Fung and Raouf Boutaba (Nov 19, 2013)
- Cryptography and Network Security: Principles and Practice (6th Edition) by William Stallings (Mar 16, 2013).
- Network and System Security, Second Edition by John R. Vacca (Sep 23, 2013).
- Network Security Essentials: Applications and Standards (4th Edition) by William Stallings (Mar 22, 2010).

- Information Security The Complete Reference, Second Edition by Mark Rhodes-Ousley (Apr 3, 2013)

COURSE	Course Name : Multivariate Data Analysis
	Course Code : IF184922
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course, the student will learn about multivariate algebra, Multivariate Normal, Types of Univariate and multivariate Methods, Multivariate Data Exploration/Multivariate Descriptive Analysis. Furthermore, students will be able to perform the modeling and analysis of the various methods of analysis multivariate, namely Multiple Dependent Models: MANOVA, PCA, and Canonical Analysis. Classification and Clustering: Cluster Analysis, Discriminant Analysis. Data Reduction: Factor Analysis. Perceptual Mapping: Multidimensional Scaling, Correspondence Analysis, Conjoint Analysis, and Structural Equation Modeling.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction
- Mastering principles and methods to solve computation problems by using calculus, matrix, statistics, approximation, linear optimization, modelling and simulation

Specific Skill:

- Able to design and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.
- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently

COURSE LEARNING OUTCOMES

- Students can explain the differences in univariate and multivariate analysis.
- Students can use a variety of appropriate multivariate modeling analysis purposes.
- Students can analyze the results of the multivariate data processing.
- Students can use multivariate statistical data processing software.

MAIN SUBJECT

The basic concept of multivariate data, multivariate Algebra, Multivariate Normal Mapping Techniques Univariate and multivariate, multivariate data exploration / Descriptive Multivariate Analysis, Multiple Dependent Models: MANOVA, PCA, Canonical Analysis. Classification and Grouping: Cluster Analysis, Discriminant Analysis. Data Reduction Techniques: Factor Analysis. Perceptual Mapping: Multidimensional Scaling, Correspondence Analysis, Conjoint Analysis. Structural Equation Modeling: The use of tools.

PREREQUISITES

Probability and Statistics

REFERENCE

- Barbara G. Tabachnick, Linda S. Fidell, "Using Multivariate Statistics", 5th Edition, Pearson International Edition, 2007.
- Joseph F. Hair, Jr., William C. Black, dkk "Multivariate Data Analysis", 7th Edition, Pearson International Edition, 2010 .
- Pendukung :
- Richard A. Johnson, Dean W. Wichern, "Applied Multivariate Statistical Analysis", Prentice Hall International Inc., 2007.

COURSE	Course Name : Computer Animation and 3D Modeling
	Course Code : IF184933
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, students study the basic concepts and programming techniques in 3D modeling and animation. Students will have experience to create 3D models and simple animation using graphics programming tools. In addition, students can also explain the state of the art in the field of advanced 3D modeling and animation

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students are able to explain the basic concepts of computer animation
- Students are able to explain theory of polygonal meshes
- Mahasiswa mampu membuat model berbasis polygon menggunakan tools pemrograman grafika
- Students are able to create polygon-based model using graphics programming tools
- Students are able to explain techniques of basic animation
- Students are able to apply the basic animation techniques using graphic programming tools
- Students are able to explain advanced animation techniques
- Students are able to apply the advanced animation techniques using C++ and API

MAIN SUBJECT

Theory of computer animation, Polygonal Meshes, Basic animation techniques, Advanced animation techniques: physical-based simulation, physically-based character simulation.

PREREQUISITES

Computer Graphics
REFERENCE
• Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012. • Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.

COURSE	Course Name : Smart Game
	Course Code : IF184935
	Credit : 3 SKS
	Semester : 6

DESCRIPTION of COURSE

In this course, students will learn about various aspect required to develop complex game. The students will study about serious game, simulation game, game computation, network for game, multiplayer game, social game and game economy

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

Students understand and able to apply game computation, simulation game, multiplayer game, social game, game economy.

MAIN SUBJECT

Game computation, simulation game, multiplayer game, social game, game economy.

PREREQUISITES

Human and Computer Interaction

REFERENCE

- Social Game Design, Monetization Methods and Mechanics, Tim Fields 2012
- Theory of Fun for Game Design, Ralph Koster, 2nd Edition Nov 2013
- David Michael, "Serious Games, Games that Educate, Train and Inform", Thomson Course Tech, Canada, 2005

COURSE	Course Name : Grid and Paralel Computing
	Course Code : IF184946
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

Parallel computing operates in principle that a large problem can be solved quickly by breaking and processing it in parallel / simultaneously. The increase in resource will make the pace of work is much more improved. This course discusses the concept of parallel computing architecture to solve problems using a parallel approach by using software and technology.

LEARNING OUTCOMES

Knowledge:

Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security

Specific Skill:

Able to implement the concept of net-centric computing, parallel computing, dis for analyzing and designing an algorithm which may be used to solve comp various fields.

COURSE LEARNING OUTCOMES

Students understand and able to apply Concepts and Terminology, von Neumann Computer Architecture, Shared Memory, Distributed Memory, Hybrid Distributed-shared memory, Programming Model and Communication, Design of Parallel Programs, Partitioning, Synchronization, Load Balancing. Programming on Multicore Architecture. Grid Portal Development, Scheduler & Grid Integration Middleware, Open Grid Services Architecture (OGSA).

MAIN SUBJECT

Concepts and Terminology, von Neumann Computer Architecture, Shared Memory, Distributed Memory, Hybrid Distributed-shared memory, Programming Model and Communication, Design of Parallel Programs, Partitioning, Synchronization, Load Balancing. Programming on Multicore Architecture. Grid Portal Development, Scheduler & Grid Integration Middleware, Open Grid Services Architecture (OGSA).

PREREQUISITES

Computer Network

REFERENCE

- Ian Foster and Carl Kesselman, The Grid: Blueprint for a New Computing Infrastructure, 2nd edition, Morgan Kaufmann Publishers, San Francisco, USA (2004), ISBN: 1-55860-933-4.
- Vladimir Silva, Grid Computing for Developers, 1st edition, Charles River Media Inc., Massachusetts, USA (2006), ISBN: 1-58450-424-2.
- Tao Yang, Lecture Notes on Parallel Scientific Computing, Department of Computer Science University of California Santa Barbara, CA 93106
- Barry Wilkinson and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd edition, Prentice Hall
- CUDA by Example: An Introduction to General-Purpose GPU Programming, 9780131387683 (0131387685), Addison Wesley, 2010

COURSE	Course Name : Pervasive Computing and Sensor Network
	Course Code : IF184947
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

This subject discusses about the concept of pervasive computing, and the aspects that can be supported by the concept. This subject also discusses about how to use techniques to support the implementation of pervasive computing such as smart devices, context-aware system and its interaction with humans.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering concept and theory of architecture, system and network computer principles based on logic
- Mastering theoretical concepts and fundamentals of net-centric computing and related-recent technologies, in the fields of distributed and mobile computing, multimedia computing, high performance computing along with information and network security
- Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

- Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to implement computer architecture and principles of operating system tasks to design, implement and manage network system with high performance, safety, and effecient
- Able to implement the concept of net-centric computing, parallel computing, distributed computing for analyzing and designing an algorithm which may be used to solve computation problem in various fields.

- Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

Students understand and able to apply the concept and techniques of pervasive computing and sensor network.

MAIN SUBJECT

Ubiquitous Computing: Basics and Vision, Modelling the Key Ubiquitous Computing, Ubiquitous System Environment Interaction, Architectural Design for UbiCom Systems: Smart DEI Model; Smart Devices and Services: Service Architecture Models, Service Provision Life Cycle, Virtual Machines and Operating Systems; Human–Computer Interaction : User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices; Tagging, Sensing and Controlling : Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real Time Systems, Control System and Robots; Context-Aware Systems : Modelling Context Aware Systems, Mobility Awareness, Spatial Awareness, Temporal Awareness: Coordinating and Scheduling, ICT System Awareness; Intelligent Systems (IS) : Basic Concepts, IS Architectures, Semantic Knowledge Based IS, Classical Logic IS, Soft Computing IS Models, IS System Operations; Ubiquitous Communication : Audio Networks, Data Networks, Wireless Data Networks; Management of Smart Devices : Managing Smart Devices in Virtual Environments, Managing Smart Devices in Human User Centred Environments, Managing Smart Devices in Physical Environments

PREREQUISITES

Computer Network

REFERENCE

- Stefan Poslad, Ubiquitous Computing Smart Devices, Environments, and Interaction, JohnWiley&Sons, Ltd., 2009
- Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill, 2005

COURSE	Course Name : Data Compression
	Course Code : IF184948
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course, students learn the various methods of compression with statistical approaches, dictionary, and its preprocess on text data, image, audio, and video.

LEARNING OUTCOMES

Knowledge:

- Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis
- Mastering principles and methods to solve computation problems by using calculus, matrix, statistics, approximation, linear optimization, modelling and simulation
- Mastering concepts and principles of collecting, processing and storing the information in various formats
- Mastering principles of algorithm development and various programming language concepts

Specific Skill:

- Able to design and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields
- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of collecting, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners
- Capable of designing and analyzing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

Students are able to implement various methods of data compression techniques including statistical-based and dictionary-based techniques on textual data, image, audio and video.

MAIN SUBJECT

- Introduction to basic compression techniques
- Introduction to basic theory of information: self-information, entropy, and code efficiency
- Lossy compression techniques and lossless
- Compression techniques with statistical approaches: Huffman, Adaptive Huffman, and arithmetic
- Dictionary-based compression techniques: LZ77, LZ78, and LZW
- Preprocessing technique for compression: MTF and BWT
- Techniques of digital image compression: JPEG and CALIC
- Audio compression technique: MPEG
- Video compression technique: ITU-T H.261

PREREQUISITES

Computer Network

REFERENCE

- Sayood, K., "Introduction to Data Compression 4th Edition", Morgan Kaufman, San Francisco, 2012
- Pu, I.M., "Fundamental Data Compression 1st Edition", Butterworth-Heinemann, Burlington, 2006
- Salomon, D., Motta, G., "Handbook of Data Compression 5th Edition", Springer, London, 2010

COURSE	Course Name : Robotics
	Course Code : IF184954
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course, students will learn about concepts of robot, kinds of robot, components of robot and how to works, learn how to build and program the robot, understand the types of robot movement and how to apply them, use and apply the various robot sensors, and apply the methods of intelligent system on robot application to solve many challenges.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to understand the concepts, kinds of robot, components of robot and how to works.
- Students are able to build robot.
- Students are able to understand robot programming.
- Students are able to understand the types of robot movement and how to apply them.
- Students are able to use and apply the various robot sensors.
- Students are able to apply the methods of intelligent system on robot application.

MAIN SUBJECT

- Introduction to robot, kinds of robot, components of robot and how to works.
- How to build robot.
- Introduction to robot programming language (use RobotC).
- Types of robot movement and how to apply them.
- Various robot sensors (light sensor, sound sensor, touch sensor, etc).

- Use and apply the various robot sensors.
- Apply the methods of intelligent system on robot application.

PREREQUISITES

Computational Intelligence

REFERENCE

- John C. Hansen, LEGO Mindstorms NXT Power Programming : Robotics in C, second edition, Variant Press, 2009
- Kim, Yong-Tae, Kobayashi, Ichiro, Kim, Euntai, Soft Computing in Advanced Robotics, Springer
- Robin R. Murphy, Introduction to AI Robotics, The MIT Press, 2000

COURSE	Course Name : Social Network Analysis
	Course Code : IF184957
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

Students will learn about data analysis techniques on social media (twitter, facebook, blog, etc) to obtain information related to user's behaviors and habits of community on the real world. Analysis outputs are quantitative and qualitative outputs including discussion topic extraction, user's mood and sentiment recognition (positive/negative), measurement of the effectiveness evaluation in social media program, relationship between users in community, exploration result on graph/table/curve etc. Analysis output information can be used as a feed back or consideration of policy making/decision support.

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

- Students are able to explain the concepts, theories and terms of data analysis techniques on social media network.
- Students are able to collect data from social network sites.
- Students are able to analyze social network using standard dataset with tools.
- Students are able to design and implement social network analysis on the real world individually or team work.

MAIN SUBJECT

- Introduction to social network analysis: networking type concept based on graph theory (full, partial, or egocentric network; unimodal, multimodal, or affiliation network; multiplex network);
- Network analysis measures for measuring community users: aggregate, vertex-specific (degree, closeness, betweenness, eigenvector); important position analysis (centrality, prestige), relationship analysis (structural balance, transitivity), social group analysis (cohesive subgroups), role and position analysis (structural equivalence);
- Community detection (node-centric, group-centric, network-centric, hierarchy-centric) and evaluation;
- Study case on social media network analysis (email, threaded conversation, twitter, facebook, world wide web, flickr, youtube, wikis);
- Application examples: pattern change in social media, classification of social network, recommendation and community behavior analysis;
- Implementation steps of social media analysis: start from collect data to visualization of analysis output individually or team work with/out open source library.

PREREQUISITES

Computational Intelligence

REFERENCE

- Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, “Social Media Mining: An Introduction”, Cambridge University Press, 2014
- Matthew A. Russell, “Mining the Social Web 2nded.”, O’Reilly, 2014
- Maksim Tsvetovat, Alexander Kouznetsov, “Social Network Analysisfor Startups”, O’Reilly, 2011

COURSE	Course Name : Deep Learning
	Course Code : IF184958
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course students learn the theories, principles and techniques of deep learning and apply it to solve real world problems that include learning single mode, multiple modes, and generative models. Students also learn the various application of deep learning such as image classification, generate information on image / video / voice data, language translation, and generate models for simulation / planning purposes.

LEARNING OUTCOMES

Knowledge:

Mastering concept and principles of Intelligent System such as representation and reasoning techniques, searching technique, intelligent agent, data mining, machine learning, and development of intelligent application in various fields, and also mastering concept and principles of computation science such as manage information, multimedia data processing, and numerical analysis

Specific Skill:

Able to desain and develop applications using principles of intelligent systems and computing science to produce intelligent applications in various fields

COURSE LEARNING OUTCOMES

- Students are able to explain the theory, principles, and various models of deep learning.
- Students are able to use appropriate deep learning model to solve various learning problems, such as single modal learning, multimodal learning, and generative model learning
- Students are able to create programs to solve real world problems using appropriate in-depth learning algorithms.
- Students are able to conduct independent research on a particular topic, write a research report with a small scope, and make a presentation.
- Students are able to criticize various methods to solve real world problems using deep learning.

MAIN SUBJECT

- Introduction of deep learning, perceptron, multi layer perceptron, algoritma training.
- Sequence Modeling with Neural Networks: recurrent neural networks, Application in machine translation, Training RNN.

- Deep Learning for Computer Vision: Image Classification Pipeline, Convolutional Neural Network, Object recognition, some applications: Image Caption Generation, Video Description Generation, Image Question Answering.
- Deep Generative Models: learn to understand data (image, audio, handwritten, language) through generation, compression as implicit generative modeling.
- Multimodal Learning: Flickr example (joint learning of images and tags), SoundNet (learning sound representation from videos), Image captioning (generating sentences from images).

PREREQUISITES

Computational Intelligence

REFERENCE

Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press Book, 2017.

COURSE	Course Name : Information Technology Governance
	Course Code : IF184964
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, students learn basic principles of Information Technology Governance. This course will discuss the importance of IT governance and IT governance framework, including project, human resource and infrastructure governance.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collecting, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to apply principles of Information Technology Governance.

MAIN SUBJECT

Business Process Management, Risk Management, IT Governance Framework (COBIT & ITIL), Project and Human Resource Governance (Human Resource, Requirement Analysis, Project Management, Change Management), Infrastructure Governance

PREREQUISITES

Database Management, Analysis and Design of Information Systems

REFERENCE

Webber, L. and Wallace, M., *IT Governance: Policies and Procedures 2014* Edition, Wolters Kluwer, 201

COURSE	Course Name : Distributed Databases
	Course Code : IF184965
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course student will learn the principal of distributed database. The topics that will be discussed are distributed database concept, distributed database architecture, query optimization, data replication, and current issues in distributed database.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to apply the principal of distributed database distributed database architecture, query optimization, data replication, and aware about current issues in distributed database

MAIN SUBJECT

- Distributed Database Design
- Data Control and Access
- Concurrency Control
- Query Optimization (Query Processing, Parallel Query, Data Decomposition and Localization)
- Deadlock Handling
- Data Replication Technique
- Transaction Management (Failure and Commit Protocols)
- Parallel Database System
- Distributed Database Object Management

PREREQUISITES

Database Management

REFERENCE

- M. T. Özsu and P. Valduriez, Principles of Distributed Database Systems, London: Springer, 2011.

- S. K. Rahimi and F. S. Haug, Distributed Database Management Systems: A Practical Approach, Hoboken, New Jersey: John Wiley & Sons, Inc., 2010

COURSE	Course Name : Geographic Information System
	Course Code : IF184967
	Credit : 3 SKS
	Semester : 7

DESCRIPTION of COURSE

In this course students will learn about different concept between geographic information systems and another information system. Students will analyze the spatial-temporal data, analysis of 3-D surface, map coordinate system and projection system. In addition, students develop theme map from gps tracking according to the latest approach.

LEARNING OUTCOMES

Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students understand and able to apply the concept of geographic information systems and another information system. Students are able to analyze the spatial-temporal data, analysis of 3-D surface, map coordinate system and projection system

MAIN SUBJECT

- Map Projection and Coordinate System
- Map digitizing
- GPS
- Remote Sensing
- Thematic Map
- Spatial Analysis
- 3-D Analysis
- Community-Based Mapping
- Location-based Services

PREREQUISITES

Object Oriented Programming

REFERENCE

- Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., 2011, Geographic Information Systems and Science, New York, John Wiley & Sons.
- Narayan Panigrahi, Computing in Geographic Information System, CRC Press, 2014
- Quantum GIS, online resources (www.qgis.org)
- OpenStreetMap, online resources
- Google Map API, online resources

COURSE	Course Name : Introduction to Programming and Logic
	Course Code : IF184982
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

In this course, students learn the introduction to programming and logic such as basic problem solving using computer approach, the basic of algorithm, and implement an algorithm using computer language, step of input-process-output, branching and looping, handle file as input and output

LEARNING OUTCOMES

Knowledge:

- Mastering principles and methods to solve computation problems by using calculus, matrixs, statistics, approximation, linear optimization, modelling and simulation
- Mastering principles of algorithm development and various programming language concepts;

Specific Skill:

- Able to solve computation problems, and mathematical modelling through exact, stochastic, probabilistic, and numeric approaches effectively and efficiently
- Capable of desaining and analizing of algorithms to solve problems effectively and efficiently based on programming principles, and able to apply programming model in various programming language; and able to choose programming languages in producing appropriate applications

COURSE LEARNING OUTCOMES

• Students capable to understand and capable to implement software development methodology • Students capable to design structured computer program • Students capable to communicate and working in team • Students capable to express ideas in verbal and written
MAIN SUBJECT
The concept of algorithms and computer programming such as: Program flowchart, standard and documentation, Application development, Input – process - output and data types, type cast and conversion, Control flows and their implementation example. Program testing, debugging and documentation.
PREREQUISITES
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REFERENCE
• Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th edition, Addison Wesley, 2012. • Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, McGraw-Hill, 2003.

COURSE	Course Name : Introduction to Database Technology
	Course Code : IF184983
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE
Through this course, students will learn about how to model data and information in the form of charts and diagrams concept of physical and apply it to the database in a DBMS using DDL. Students also learn about the concept of relational algebra and data manipulation language (DML) and its application to manage data and information in a database. Students also learn to create database applications to manipulate data in the database. Concepts and practice is done in the classroom and laboratory individual and group. Case studies are used in lectures is a real
LEARNING OUTCOMES
Knowledge:

Mastering concepts and principles of collecting, processing and storing the information in various formats

Specific Skill:

Capable of collectiing, digitalizing, representing and transforming data into new useful information by using data modeling and storage in effective and efficient manners

COURSE LEARNING OUTCOMES

Students are able to model data and information in the form of conceptual diagram and physical diagram. And according to the model, students are able to create relational database in a DBMS, able to implement the DDL, DML and query.

MAIN SUBJECT

- **BASIC CONCEPTS OF INFORMATION MANAGEMENT:** differences in the data, information and knowledge ; benefit from data and information to support human needs; demonstration of the use of data and information for the organization; identification of issues persistent data usage in organizations; evaluation of the use of small to medium scale applications to meet the real needs of users.
- **DATABASE SYSTEMS:** characteristics that distinguish the database approach with traditional approaches to programming with data files; evolution of database and systems approach; the basic purpose, function model, application components and social impact from database systems ; identification of the main function from DBMS and describing its role in the system database; concept of data independence and importance in the database systems; the use of declarative query language to obtain information from databases;
- **DATA MODELLING:** categories based on the type of concept data model is provided to describe the structure of the database (concept data model, physical data model, and representational data model), modeling concepts and the use of modeling notation (ERD, UML); relational data model, the basic principles of the relational data model, modeling concepts and notation of the relational data model; The main concept of OO model such as identity, type constructor, inheritance, polymorphism, and versioning; differences in relational data model with semi-structured data model (DTD, XML Schema).
- **RELATIONAL DATABASE:** relational schema from conceptual model created using the model er; relational database design; the concept of integrity constraints and referential integrity constraints; the use of relational algebra operations from mathematical set theory (union, intersection, difference, and Cartesian product) and relational algebra

operations to database (select, restrict, project, join, and division); query in the tuple relational algebra and relational calculus; Functional dependence between two or more attributes that are a subset relations, Decomposition of a schema; lossless-join and dependency-preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued dependency (4NF), Join dependency (PJNF, 5NF), Representation theory

- BAHASA QUERY: bahasa database, SQL (DDL dan DML untuk mendefinisi struktur data, query, update, batasan-batasan, integritas); QBE dan 4th-generation environments, Nested Queries & Set Comparison. Fungsi EXISTS & NOT EXISTS, Eksplisit Set & NULL, Penamaan Kembali, Fungsi Aggregate & Grouping, Substring Comparison, Arithmetic Operator & Ordering, VIEW dalam SQL
- DATABASE APPLICATION

PREREQUISITES

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REFERENCE

- Ramakrishnan, Raghu, Gehrke, Johannes. 2003. Database Management Systems, Third Edition. New York: The McGraw-Hill Companies, Inc.
- Howe, David; Data analysis for Database Design, third Edition, Butterworth-Heineman, 2001

COURSE	Course Name : Introduction to Game Development
	Course Code : IF184985
	Credit : 3 SKS
	Semester : 8

DESCRIPTION of COURSE

This course aims to make students able to develop a computer game based on the basic theories of game development. At the beginning of this course students will learn about the history and development of game technology, some popular games, also game classifications based on genres, theme and others.

The next stage will learn about the game development process, how to design a game, the game documentation (GDD), then learn about theory of fun in game and edutainment. Until the end of course, students with team will be able to implement game development.

LEARNING OUTCOMES

Knowledge:

Mastering the concepts and principles of computer graphics including modeling, rendering, animation, and visualization, and also mastering the concepts and principles of human computer interaction.

Specific Skill:

Able to develop application using computer graphics principles including modeling, rendering, animation, and visualization, implement human computer interaction principles, and evaluate the efficiency of the appropriate interface in the application developed.

COURSE LEARNING OUTCOMES

- Students able to classify games based on genre, theme and rate
- Students able to create a game design document (GDD)
- Students with team able to develop a game with middleware

MAIN SUBJECT

Game theory, game development process, game design document, interface design for game, game middleware, edutainment, theory of fun.

PREREQUISITES

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REFERENCE

Arnest Adam, "Fundamentals of Game Design", New Riders Press, 2nd Edition 2010