

# Curriculum

2003/2004, [http://www.aitel.hist.no/english/programmes/curriculum/3y\\_undergraduate/3y\\_year3.php](http://www.aitel.hist.no/english/programmes/curriculum/3y_undergraduate/3y_year3.php)

Class: HISU2001H, Programme : Sør-Trøndelag University College/Computer Engineering

Course number	Courses	Exam date	ECTS		2002/2003		2003/2004		2004/2005	
			credits		Vekttall		Studiepoeng			
					atumn	spring	atumn	spring	atumn	spring
	<b>Basic courses</b>		39							
GO007A	Discrete Mathematics and Linear Algebra	12.12.2003	6				1	1		
GO010A	Mathematical Analysis	10.12.2002	6	1	1					
GO020D	Mathematical Analysis 2	13.05.2003	6		3	3				
GO040D	Statistics	28.05.2004	6					3	3	
GO250A	Physics	13.12.2002	6	1	1					
GO060A	Environmental Chemistry	08.12.2003	9				1,5	1,5		
	<b>Social studies courses</b>		12							
LO066D	Managerial Economics	20.12.2004	6					3	3	
FO085D	Management and Communication		6					3	3	
	<b>Main courses</b>		54							
PO701D	Working in Projects		6	1	1					
LO172D	Programming with Java	12.12.2002	6	1	1					
LO191D	Intermediate Programming	28.02.2003	6		1	1				
LO245D	Computer Systems	06.12.2002	9		1,5	1,5				
LO235D	Systems Engineering and Databases	12.05.2004	15				4,5	4,5	3	3
LO117D	Algorithmic Methods	03.12.2003	6				3	3		
LO231D	Data Communication	05.05.2004	6					3	3	
	<b>Courses in Systems Development</b>		36							
SO326D	Advanced Software Engineering	08.12.2004	9					4,5	4,5	
SO329D	Software Quality	10.12.2004	9						3	3
SO390D	Software Systems	15.12.2004	18						6	9
	<b>Optional courses: minimum 12 ECTS credits</b>		36							
	Courses from the Network University:									
LV197D	Web programming with PHP	15.12.2004	6						3	3
SO350D	J2ME for programming of mobile devices	06.12.2004	6						3	3
LO502D	Product development and Marketing Management	18.05.2005	6							3
LV194D	C++ for Java Programmers	25.05.2005	6							3
(NTNU)	Skandia Take Off (see attachment)	Dec 2004	6						6	
BO803D	Main project		18							3
Total			195	33	27	33	27	30	30	

# Course Descriptions

[http://crowley.stud.aitel.hist.no/fagbeskrivelser/vis\\_fagbeskrivelser.asp](http://crowley.stud.aitel.hist.no/fagbeskrivelser/vis_fagbeskrivelser.asp)

## **GO007A : DISCRETE MATHEMATICS AND LINEAR ALGEBRA**

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**COURSE OBJECTIVES:** The course aims at developing understanding of mathematical concepts, approach to solutions for applications to related subjects in professional and further education contexts.

**SUBJECTS:** The logic of statements, methods of proof, Recurrence relations, Systems of linear equations, Matrices, Vector spaces, Linear transformations, Eigenvalues, Eigenvectors, Diagonalization of matrices, Systems of linear recurrence relations, Systems of linear differential equations.

ECTS credits: 6

Required exercises: 3 out of 5 exercises.

Form of teaching: Lectures.

Evaluation: Written test.

Duration of exam: 4 hours

Aids: Cappelen, Dalen m. fl.: Tabeller og formelsamling for ingeniørhøgskolen, Gyldendal, Formelsamling i matematikk for v.g.s., Gyldendal, Calculator type 2.

**TEXTBOOKS:** Søyland: Diskret matematikk, 2nd ed., Søyland: Lineær algebra, 3rd ed.

## **GO010A : MATHEMATICAL ANALYSIS 1**

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**COURSE OBJECTIVES:** The course aims at developing understanding of mathematical concepts, approach to solutions for applications to related subjects in professional and further education contexts.

**SUBJECTS:** Inverse functions, Differentiation with applications, Limit of a function, Integration with applications, Methods for integration, Differential equations of first order, Linear differential equations of second order, Numerical methods.

ECTS credits: 6

Required exercises: 3 out of 5 exercises.

Form of teaching: Lectures.

Evaluation: Written test.

Duration of exam: 4 hours

Aids: Cappelen, Dalen m. fl.: Tabeller og formelsamling for ingeniørhøgskolen, Gyldendal, Formelsamling i matematikk for v.g.s., Gyldendal, Calculator type 2.

**TEXTBOOKS:** James Stewart: Calculus (early transcendentals), Fifth Edition, Brooks/Cole.

## **GO020A : MATHEMATICAL ANALYSIS 2**

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**COURSE OBJECTIVES:** The course aims at developing understanding of mathematical concepts, approach to solutions for applications to related subjects in professional and further education contexts.

**SUBJECTS:** Functions of several variables, Taylor and Maclaurin series, Fourier series, Laplace transform

ECTS credits: 6

Prerequisites: Mathematical analysis 1

Required exercises: 3 out of 5 exercises.

Form of teaching: Lectures.

Evaluation: Written test.

Duration of exam: 4 hours

Aids: Cappelen, Dalen m. fl.: Tabeller og formelsamling for ingeniørhøgskolen, Gyldendal, Formelsamling i matematikk for v.g.s., Gyldendal, Calculator type 2.

**TEXTBOOKS:** James Stewart: Calculus (early transcendentals), Fourth Edition, Brooks/Cole, John R. Søyland: Matematiske metoder 2.

## **GO040A : STATISTICS**

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**COURSE OBJECTIVES:** The course aims at developing understanding of relevant information processing and how to implement statistical subjects in the planning, control and decision-making stage.

**SUBJECTS:** Descriptive statistics, Probability, Point and interval estimation, Testing statistical hypotheses, Correlation, Regression, Statistical simulation, Quality control.

ECTS credits: 6

Prerequisites:

Required exercises: 3 out of 5 exercises.

Form of teaching: Lectures.

Evaluation: Written test.

Duration of exam: 4 hours

Aids: Formula sheet, Calculator type 2.

**TEXTBOOKS:** Per Chr. Hagen: Innføring i sannsynlighetsregning og statistikk. Cappelen 1998 (2nd ed.) eller Cappelen 2000 (3rd ed)

## **GO060A : ENVIRONMENTAL CHEMISTRY**

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Norwegian course title: Kjemi og miljølære

Credit points (60 points = 1 year study): 9

Year: 2001-2002

Student work: (enter exercises...)

Prequalifications: (none)

Evaluation: 5 hour written test

Contents:

General Chemistry including : Nomenclature Rules, Stoichiometry, Chemical Equilibrium, Acid-base reactions and Electro Chemistry. Organic Chemistry. Environmental Studies including : Ecology, Air Pollution, Water Pollution, Cleaning Technology, Energy, Waste Problems and regulations relating to Working Environment and Environmental Protection. Project (environment). Laboratory Work.

Literature: Nils Chr. Boye: Kjemi og miljølære, Universitetsforlaget 1999 (2. utgave). Utdelt lærestoff.

## **LO066D MANAGERIAL ECONOMICS AND ACCOUNTING ANALYSIS**

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Norwegian course title: Økonomisk styring

Credit points (60 points = 1 year study): 6

Year: 2004-2005

Student work: Compulsory work

Prequalifications: (none specified)

*Evaluation:* 3 hour written exam

Objectives:

The course will provide understanding of some aspects in Managerial Economics and Accounting. The course gives a basic understanding of economic theory and some training in business accounting.

Contents:

Introduction to basic accounting. Debit-credit. Period accounting. Salary and taxes. Basic book-keeping. Cost analysis - cost minimization. Estimation of production and cost functions. Break-even charts. Profit - volume analysis. Budgets.

Literature: Trond Kristoffersen: Årsregnskapet – en grundig innføring, first edition. Fagbokforlaget, 2002.

## **FO085D : MANAGEMENT AND COMMUNICATION**

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Norwegian course title: Administrativ styring

Credit points (60 points = 1 year study): 6

Year: 2004-2005

Student work: Two project works. Exercises.

Prequalifications: None

Evaluation: Two projects with presentations.

Objectives:

To give the students an introduction to the legal system and to give them an understanding of modern organizations and how they interact. Which kind of conflicts develops and how do we solve them? Why are changes important and what are successful reframing?

Contents:

Contract laws, law of torts, laws of sales, laws of employment and various other business-laws. Organizations in an historical perspective. Japanism as a way of organizing? How do we learn to understand our organization? The Structural frame, the Human resource frame, the Political frame, the Symbolic frame. How to be a better leader.

Literature: Bolman & Deal: Reframing Organizations Fr.Fr. Gundersen and Arthur Brudvik: Laws for economists. Norwegian Laws. Notes from the lecturers.

## **PO701D WORKING IN PROJECTS**

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Norwegian course title: Prosjektteknikk

Credit points (60 points = 1 year study): 6

Year: 2002-2003

Student work: Exercises and project.

Prequalifications: Parallell with or after course LO307D Introduction to Information Technology.

Evaluation: Evaluation of fulfilled course, exercises and project.

Objectives:

An introduction in how to work in project. Learn how to co-operate through Internet by using a computer supported collaborative tool.

Contents:

Teamwork and co-operation. Principles for teamwork. Project management and organisation. Specification of requirements. Project case.

Literature: To be considered.

## **LO172D PROGRAMMING WITH JAVA**

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Norwegian course title: Programmering i Java

Credit points (60 points = 1 year study): 6

Year: 2002-2003

Student work: A number of obligatory exercises.

Prequalifications: Basic to medium computing experience.

Evaluation: Evaluation during the semester and 4 hours written exam.

Objectives:

Object oriented program design in Java.

Contents:

Theory of object orientation: classes, class hierarchies, objects, encapsulation etc. Java syntax: Data types, conditions, iterations, loops, expressions. Input and output. Components for graphical user interfaces. Different programming tools, and their weaknesses and strengths.

Literature: Lervik & Havdal: Programmering i Java (Gyldendal) Last edition

## **LO191D INTERMEDIATE PROGRAMMING**

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Norwegian course title: Videregående programmering

Credit points (60 points = 1 year study): 6

Year: 2002-2003

Student work: Compulsory programming exercises

Prequalifications: LO172D or equivalent.

Evaluation: Written exam, 4 hours.

Objectives:

After completed course the students should have a thorough knowledge of object oriented and event oriented programming in Java.

Contents:

UML class diagrams with associations and generalisation. Implementation in Java. Inheritance and polymorphism. Array-lists (Vectors). Files and streams. Serialisation. The event model. GUI(Swing)-components. Layout Managers and user dialogues.

Literature: Lervik and Havdal: Programmering i Java. Gyldendal Akademisk.

## **LO245D COMPUTER SYSTEMS**

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Norwegian course title: Datateknikk

Credit points (60 points = 1 year study): 9

Year: 2002-2003

Student work: (description of student work)

Prequalifications: (none specified)

Evaluation: 3 hour, written exam

Objectives:

Two main topics: 'Computer architecture and organization' and 'operating systems'.

Contents:

Subjects in Computer architecture and organization: The computer's main components, their function and organization: CPU, Bus, Primary memory, cache, I/O, secondary memory. Interrupt mechanism. Number systems, binary logics, data representation and dataarithmetics. 16- and 32-bits programs. The components of the CPU: Micro operations, micro programming and hard logic, pipeline, superscalar architectures, dynamic executions, RISC/CISC. Subjects in Operating Systems: Operating System Concepts, the structure of operating systems. Processes and Process administration. Memory administration. Deadlock. File systems. Input and Output System. Simple systemsprogramming.

Literature: Not decided

## **LO235D SYSTEMS ENGINEERING AND DATABASES**

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Norwegian course title: Systemutvikling med databaseprosjekt

Credit points (60 points = 1 year study): 15

Year: 2002-2003

Student work: Compulsory exercises and project

Prequalifications: A course in basic Java programming.

Evaluation: 4-hours written exam which amounts to 50% of the final grade. The project constitutes the last 50% of the final grade. Textbook and notes permitted

#### Objectives:

After accomplishing this course, the students should be able to use methods, techniques and tools for mapping, analysing and designing information system requirements. Students should be able to construct databases on the basis of data models, to use a relevant database management system, to use SQL and to document knowledge in planning and carrying out an information system to build Java-based front-end applications.

#### Contents:

System Engineering(30%): What is an information system and what kind of importance does it have in an organization and what kind of activities has be carried out to develop the information system? Models, methods, techniques and tools for analyzing user requirements. Requirements analysis. Life Cycle models. Acceptance testing. Methods of analysis. A plan for a system engineering project. Databases(30%): ANSI/SPARC-architecture, the relational model, Entity-Relationship- and UML(classdiagram)modeling, from logical database design to physical database design, normalization, SQL and concurrency control. Project(40%): Including a Java-base user interface.

Literature: Databases: Thomas Connolly, Carolyn Begg, Ann Strachan: DATABASE SYSTEMS, A Practical Approach to Design, Implementation, and Management: ISBN 0-201-34287-1. System Engineering: Valacich,George,Hoffer: Essentials of System Analysis & Design

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### **LO117D ALGORITHMIC METHODS**

Norwegian course title: Algoritmske metoder

Credit points (60 points = 1 year study): 6

Year: 2002-2003

Student work: 4 mandatory

Prequalifications: Some programming knowledge is necessary

Evaluation: Written, 3 hours. Textbook, notes etc. allowed. Grades depend on exam and excersises

#### Objectives:

Learn to design programs in a logical and proper way. Learn a few common algorithms and data structures, and to use them appropriately.

#### Contents:

Algorithms and techniques: Searching and sorting algorithms. Complexity and O-notation, determining running time. Graph theory. Greedy algorithms. Data structures: Priority queues, trees, graphs, hash tables.

Literature: Cormen (and others): Introduction to Algorithms, second edition

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### **LO231D DATA COMMUNICATION**

Norwegian course title: Datakommunikasjon

Credit points (60 points = 1 year study): 6

Year: 2002-2003

Student work: 8 of 12 exercises

Prequalifications: (none)

Evaluation: A 3 hour written exam, no written aid

#### Objectives:

The objective of the course is to give the participants an introduction to how a PC communicates with its surroundings. The participants must also understand how the layerdivided-modell is working and structured.

#### Contents:

Reference models, TCP/IP and OSI. Transmissionstechnique and cables. Error- flow- and sequenscontrol, CSMA/CD, Token passing, Routing and adresssing, IP. End to end communication, TCP, UDP, Sockets. Application services, http, cryptography, mime, e-mail. Telecommunication services, ISDN, xDSL. New technologies, IP telephoni, H323, WAP.

Literature: To be announced

## **SO326D ADVANCED SOFTWARE ENGINEERING**

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Norwegian course title: Programutviklingsmetoder

Credit points (60 points = 1 year study): 9

Year: 2002-2003

Student work: Exercises. Project.

Prequalifications: Knowledge in systems engineering and experience with an object-oriented programming language will be beneficial.

Evaluation: 5 hours. All written material is allowed.

Objectives:

An advanced course in design and engineering of large software systems.

Contents:

· Process models · Formal methods in specification · Object-oriented analyses, design, and programming · Modelling. UML. · Software Architectures

Literature: To be decided

## **SO329D SOFTWARE QUALITY**

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Norwegian course title: Kvalitet i programvaresystemer

Credit points (60 points = 1 year study): 9

Year: 2003-2004

Student work: Exercises.

Prequalifications: Non. A course in software engineering is beneficial.

Evaluation: 4 hours. All written material is allowed.

Objectives:

The students shall learn how to assure the quality of large software systems. They shall learn how the development process influences the quality of the product. The principles of total quality is central.

Contents:

What is software quality? Quality assurance. Quality standards. ISO 9000 and software. Capability Maturity Models. Inspections and walk-throughs. Testing. Measurements. Estimation. Configuration control Statistical process control and software development. Tools and techniques for problem-solving.

Literature: To be decided.

## **SO390D SOFTWARE SYSTEMS**

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Norwegian course title: Programvaresystemer

Credit points (60 points = 1 year study): 21

Student work: Exercises. A project.

Prequalifications: The courses SO326D Advanced Software Engineering, LO191D Intermediate programming, and LO235D Systems Engineering.

Evaluation: 5 hours. Project counts for 45% of the grade. The project grade may (not often) differ between the members of one project group.

Objectives:

The course introduces the student to development of modern software systems. The students shall be trained in planning and managing a realistic software development project.

Contents:

Design of user interfaces. J2EE and distributed systems: Java sockets and threads. Java RMI. Transactions and JDBC. 3-layer/N-layer system design. How to install J2EE application server. Theory about J2EE/Enterprise

Beans. JNDI. SessionBeans. EntityBeans. Mail API. A look at JMS and Web services. Web programming with JavaServer Pages: Getting and installing a web-server. Client vs. server programming. Client side validation with JavaScript. HTML forms. GET/POST. Processing HTML form information. JSP: Expressions, scriptlets, servlets, declarations, predefined variables, handling exceptions. Storing state information in cookies or by session objects. Data files at the server side. Databases. Working with the Recordset object. Using SQL from a JSP program. Use of Java classes. Comparing JSP to servlets.

Literature: Distance learning lectures and handouts. Else Lervik og Vegard B. Havdal: Java The UML Way. Integrating Object-Oriented Design and Programming John Wiley & Sons, Ltd, 2002. Kevin Boone: Enterprise JavaBeans Technology. Prentice Hall 2003.

## **LO502D PRODUCT DEVELOPMENT AND MARKETING MANAGEMENT**

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Credit points (60 points = 1 year study): 6

Year: 2004-2005

Student work: Compulsory work

Prequalifications: (none specified)

Evaluation: 3 hour written exam

Objectives:

The course will provide understanding of important aspects in development of products, and the importance of market orientation and general market understanding. This course looks at general and technical product development with focus on marketing aspects such as analyzing consumer markets, dealing with competition, identifying market segments and selecting target markets.

Contents:

This course will look at different models for product development, development of new concepts, identification of customer needs, analyzing of market opportunities, organization of the marketing and the product development process, buyer behaviour, market strategies, market segmentation, positioning and differentiating the market offering and the development of a marketing plan.

Literature: Philip Kotler: Marketing Management, eleventh edition. Prentice Hall, 2002.

## **LV197D WEB PROGRAMMING WITH PHP**

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Norwegian course title: Web-programmering med PHP

Credit points (60 points = 1 year study): 6

Year: 2003-2004

Student work: Mandatory exercises

Prequalifications: Basic knowledge in web programming and HTML, i.e. corresponding to the course LV375D Advanced Web Publishing. Basic programming skills is an advantage

Evaluation: A written exam, 3 hours

Objectives:

Give an understanding of the possibilities provided by PHP-programming, and practical exercise of web applications

Contents:

Short introduction to PHP-programming (datatypes, arrays, syntax, control structures, functions etc). Form processing. Sessions and cookies. SQL and databases. Basic filehandling. Templates. Security aspects. XML-integration. Automatic generation of graphics/illustrations, e-mails and PDF files. Object oriented versus procedural approaches.

Literature: To be informed later.

## **SO350D J2ME FOR PROGRAMMING OF MOBILE DEVICES**

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Norwegian title: J2ME for programmering av mobile enheter.

Credit points (60 points = 1 year study): 6

Student work: Exercises and a small project.

Prequalifications: Basic java course like LO172D (preferrably some more experience).

Evaluering: Written exam. 3 hours.

Responsible person: Tomas Holt

Objectives: The student should be able to make up to advanced applications for mobile devices.

Content: Installation of J2ME and necessary environment. Comparing J2SE to J2ME. GUI programming.

Persistence storage. Communication with the world. Game and sound API. Performance tuning.

Literature: Not decided yet.

## **LV194D C++ FOR JAVA PROGRAMMERS**

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Norwegian course title: C++ for Javaprogrammerere

Credit points (60 points = 1 year study): 6

Year: 2003-2004

Student work: Exercises.

Prequalifications: An introductory course in Java and object-oriented programming.

Evaluation: 3 hours. All written material allowed.

Objectives:

The student shall after completion of the course be able to: - use C++ for advanced programming tasks - write interactive programs for MS Window's platforms - write programs based on MS Window's component model

Contents:

C++ versus Java. Especially pointers. Multiple inheritance. Input/output, files and streams. Templates. Standard template library. Microsoft Foundation Class library. DLL. Database management. ActiveX. COM. DCOM.

C++ programming for the Internet.

Literature: To be decided.

## **BO803D MAIN PROJECT**

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Norwegian course title: Hovedprosjekt

Credit points (60 points = 1 year study): 18

Year: 2003-2004

Student work: Project report

Prequalifications: none specified

Evaluation: A short presentation of the project. Evaluation of the final product and project process. Individual evaluation.

Objectives:

The students shall apply Software Engineering skills and knowledge of Distributed Systems to a large software engineering project. The work is usually conducted in a group. The group is required to prepare a report documenting the project. The project may be assigned to a local company.

Contents:

The project is normally a group work supervised and guided by personell at HiST and/or an external supervisor.

Literature: Depends on project task



## Entrepreneurship Center

[http://www.nec.ntnu.no/prosjekt/e\\_skandia.htm](http://www.nec.ntnu.no/prosjekt/e_skandia.htm)

Skandia Take Off assembles 6 groups, each comprised of a concept originator, an advisor, 2 resource people and 5 students. Each of the concepts is an actual project recruited via local collaborative partners in the Trøndelag or Jämtland regions. In the course of 6 intensive days -- beginning Sunday and concluding Friday -- each group develops a comprehensive business plan for the concept originator's business idea. These business plans are then presented to and evaluated by a panel made up of bankers, financiers and venture capitalists. Post participation in Skandia Take Off, students are offered the possibility of continuing to work on the project in the form of a summer job or in terms of project work.

### Goal:

Skandia Take Off has two program goals for its participants:

1. To offer concept originators from all over Norway the chance to utilize the technical and commercial expertise found within the NTNU / SINTEF environments, while further developing and commercializing their products and business ideas.
2. To offer resource people from colleges, universities, and public support apparatuses, as well as students from the Trøndelag og Jämtland regions, the opportunity to develop their entrepreneurial expertise through participation in the program.

### Skandia Take Off Program Content:



Skandia Take Off's target group is technology based ideas and concept originators. In other words, the projects are demanding both technologically and marketwise, and can therefore make use of the complete expertise base found at NTNU and SINTEF. In the filtering stage NEC, in cooperation with collaborative partners in Trøndelag and Jamtland, evaluates up to 100 potential ideas and makes a selection based on business potential, technical risks and organizational implementation capabilities.

After the 6 concept originators and their ideas have been selected, we assemble six resource groups to support the ideas. These groups consist of an advisor, 2 resource people from colleges or from public support apparatuses, together with 5 students from NTNU, the Nord-Trøndelag University College, Sør-Trøndelag University College or from Mitthøgskolen. These groups are then quartered at a Trondheim area hotel, where they complete a thorough market analysis of the projects commercial potential. This involves visiting and interviewing potential customers, distributors and other collaborative partners for the project. The information gathered provides the foundation for the strategic choices which are then made. The material is synthesized into a complete business plan, which is presented to a panel of bankers, financiers and venture capitalists. This panel provides feedback regarding its views on the potential of the business idea, the quality of the business plan and how realistic the implementation plan is.

Project plan realization is accomplished by providing participant companies with expertise from the college/university environment in the form of three different options:

1. Companies can submit issues/concerns, which then form the basis for a student conducted project. Each project is allotted 5000 NOK to cover the student's travel expenses.
2. Companies can receive up to 5000 NOK per month, for a maximum of two months, to hire student interns. These internships can form the foundation for positions post graduation, making the transition into a first job after university easier.
3. Companies can receive up to 100,000 NOK in order that they might engage a field specialist from one of the educational institutions for a minimum of one year. This field specialist can, for example, contribute to strengthening the foundation for the company's marketing and technological choices.

The concept originators who participate receive a completely developed business plan for their project. The concept originator sits in the driver's seat in terms of developing the business idea and through the process, is able to test their commercialization plans and train in communicating their project to a constructive and outside audience. In addition, during the course of Skandia Take Off, these entrepreneurs get the opportunity to come in contact with relevant academic environments at NTNU, SINTEF, Mitthogskolan, Nord-Trøndelag University College, or Sør-Trøndelag University College.

The students and resource personnel who participate get practical training in developing a business idea into a comprehensive business plan for an actual project. In addition they receive the unique possibility of working within a new venture project, seeing it from the concept originator's perspective, as well as they receive valuable experience in working with a team with time constraints.

#### **Relevant URLs**

Interreg III A Sweden - Norway (<http://www.interreg-sverige-norge.com>)